ELECTRICAL TIMES

THURSDAY
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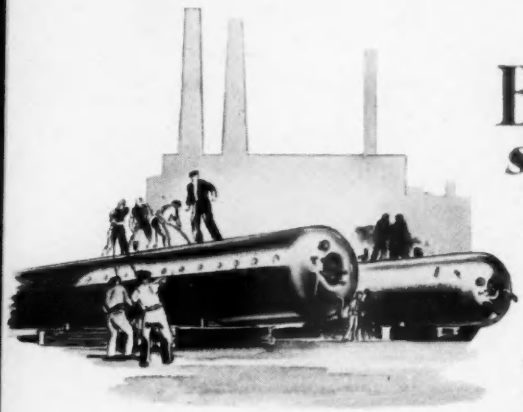

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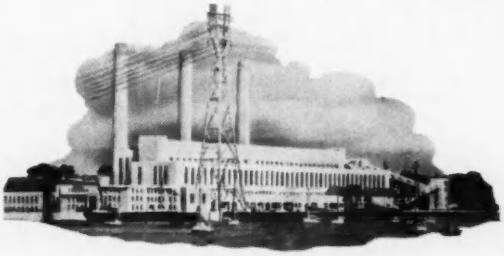

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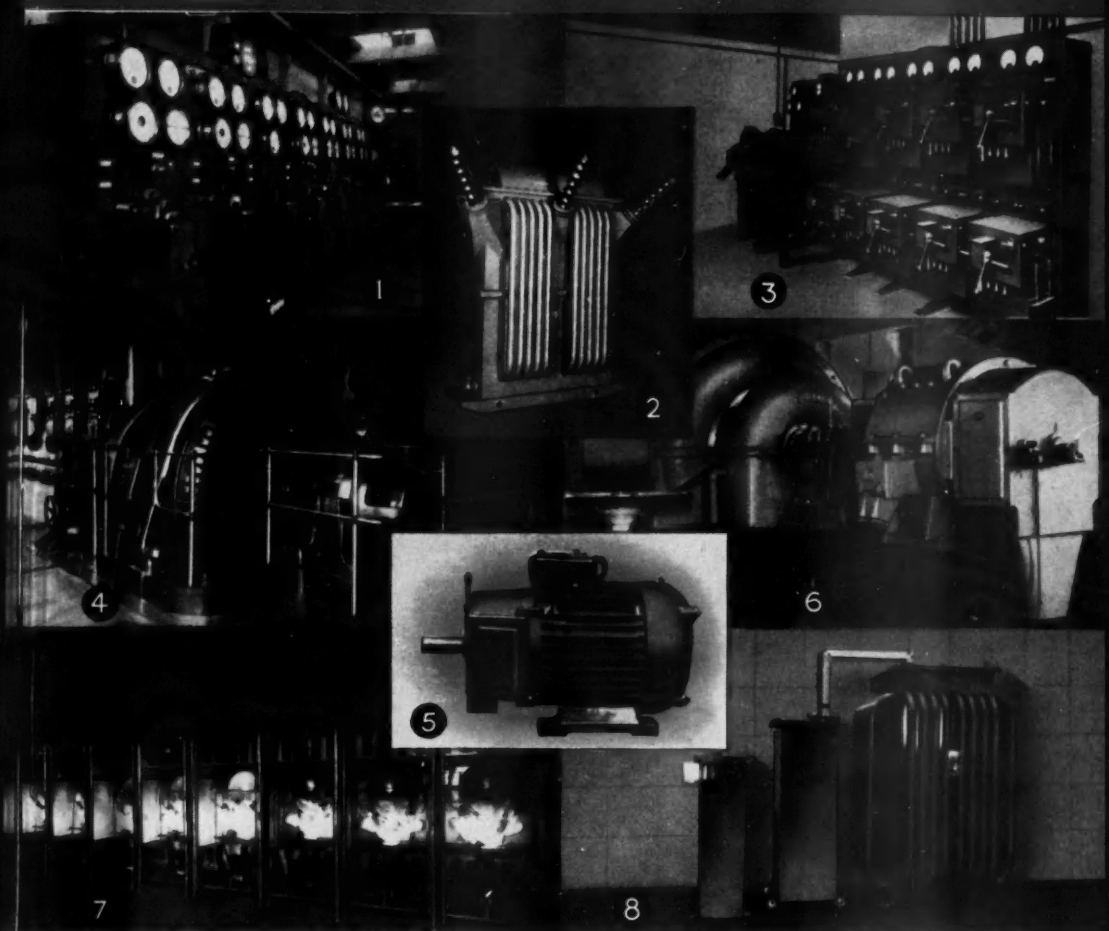

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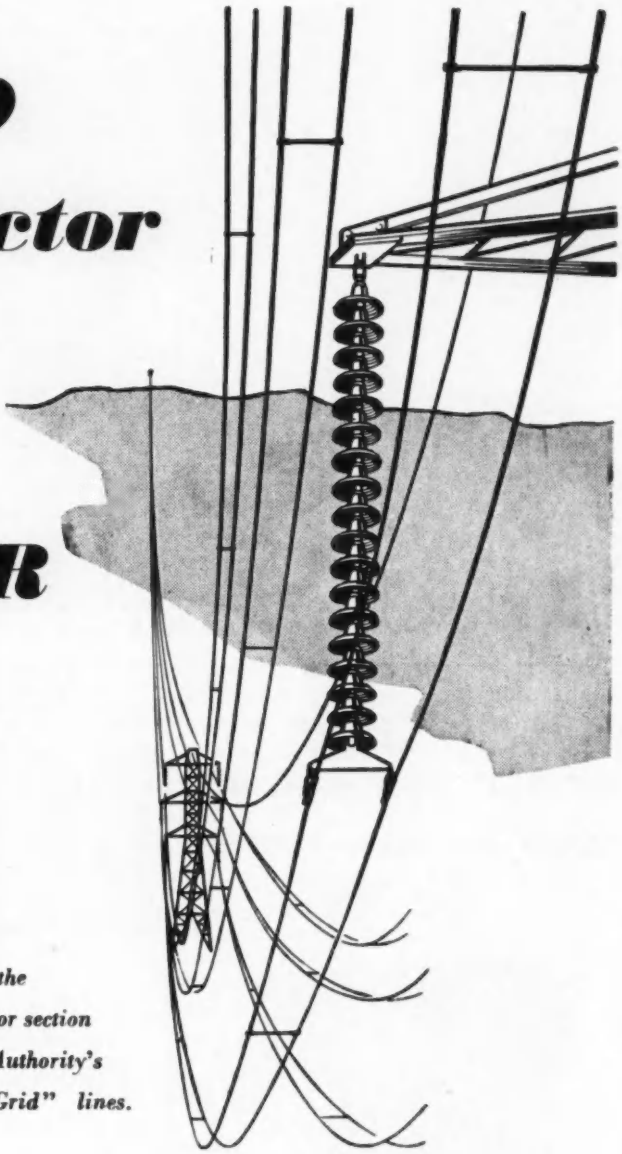

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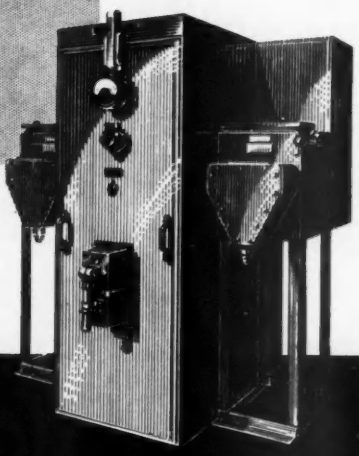

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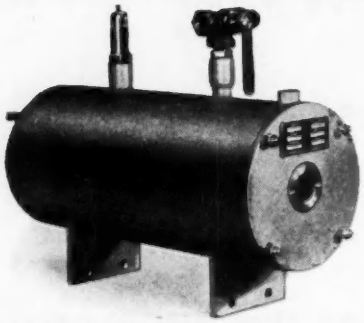

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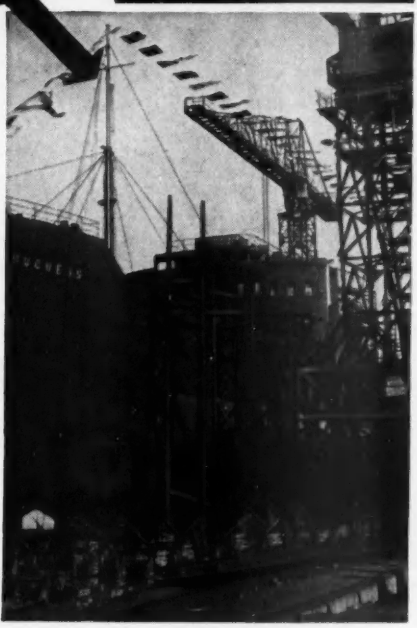
Over the hills....and far away



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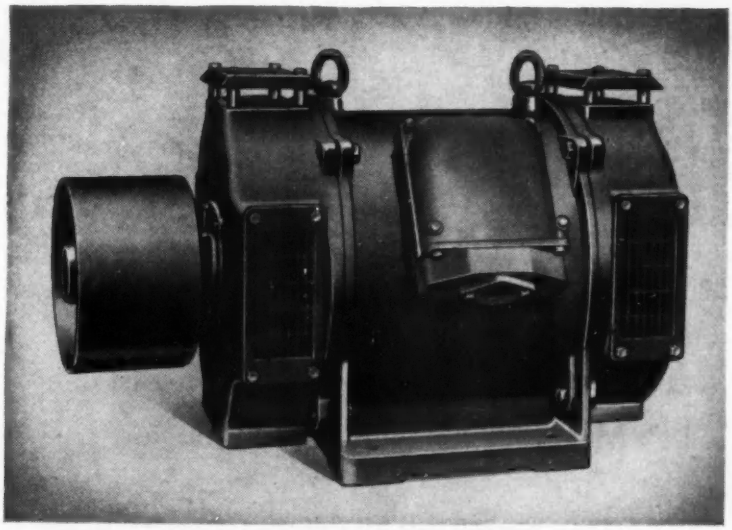

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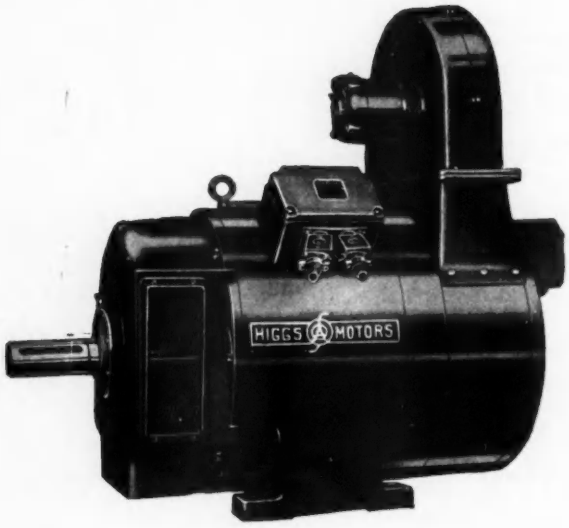

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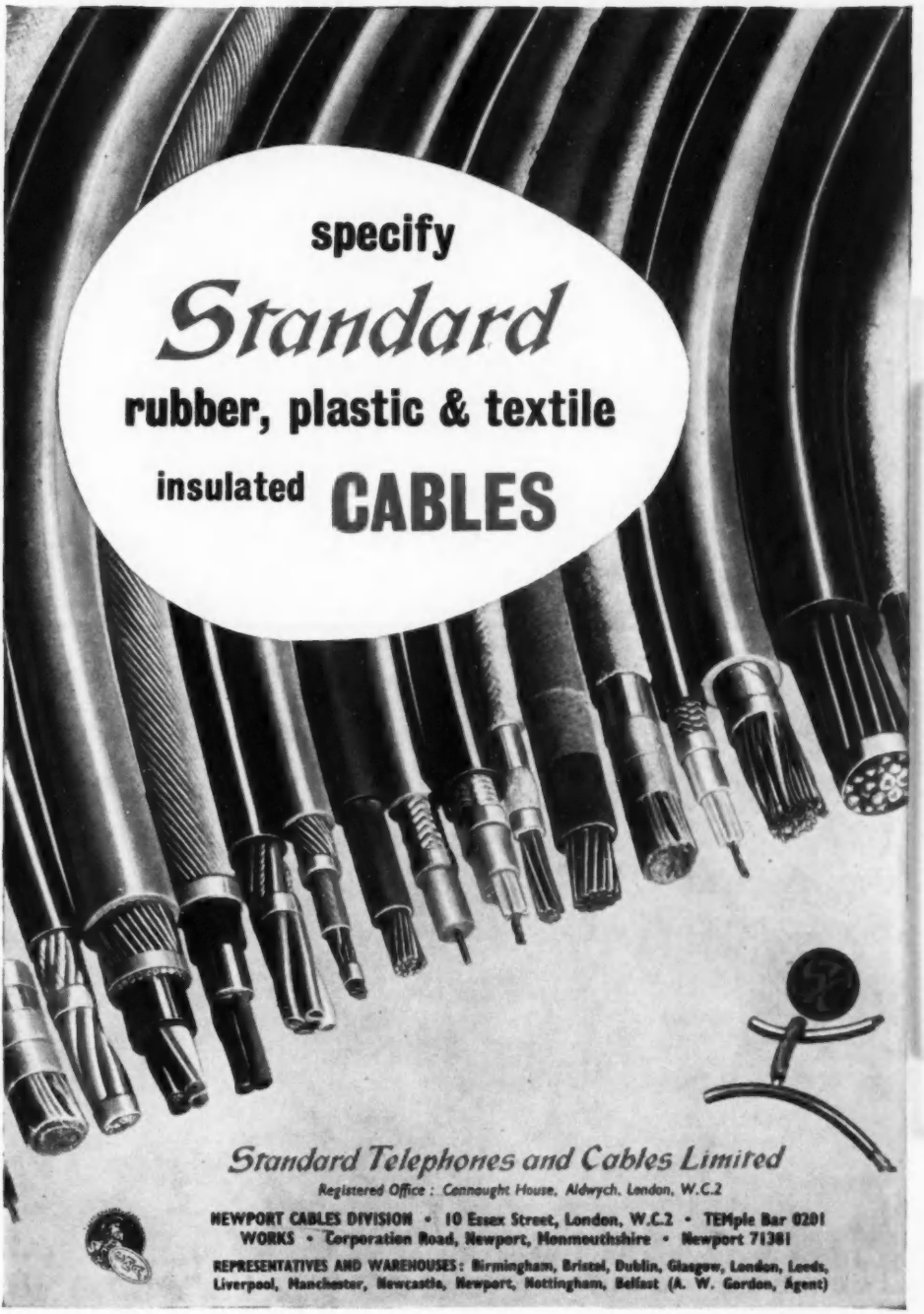
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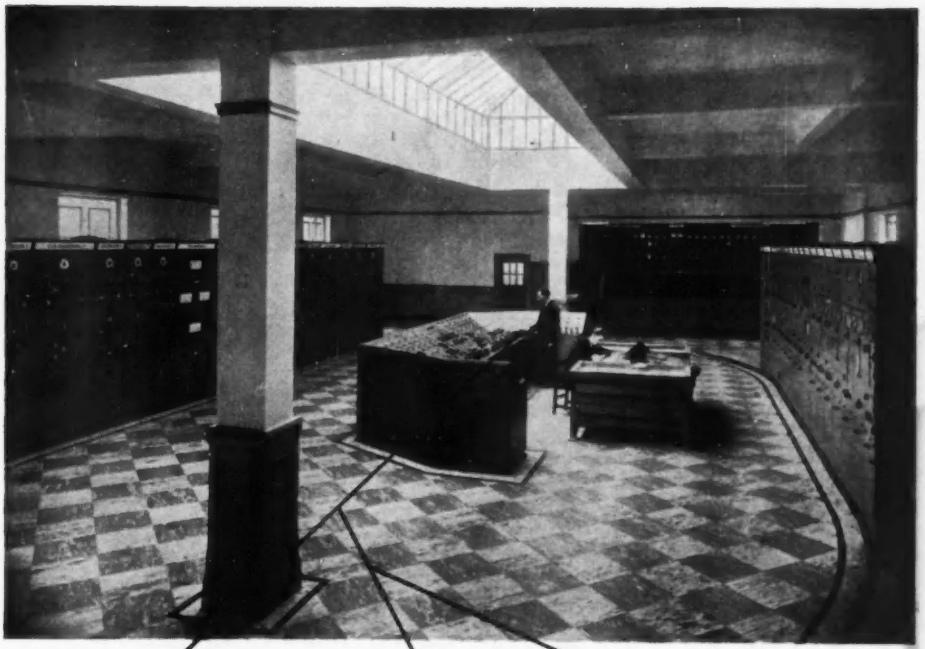

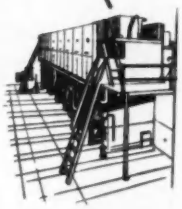

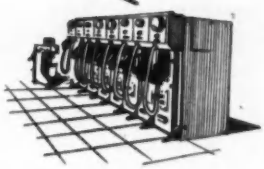

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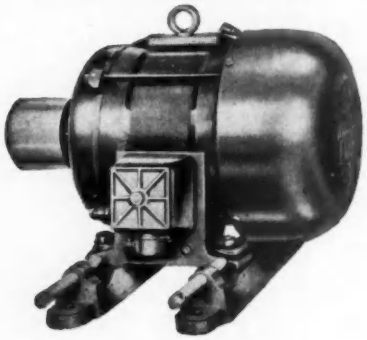

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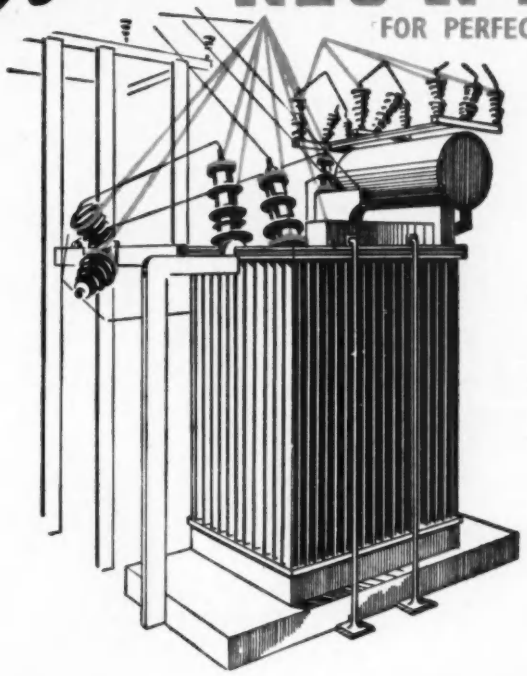

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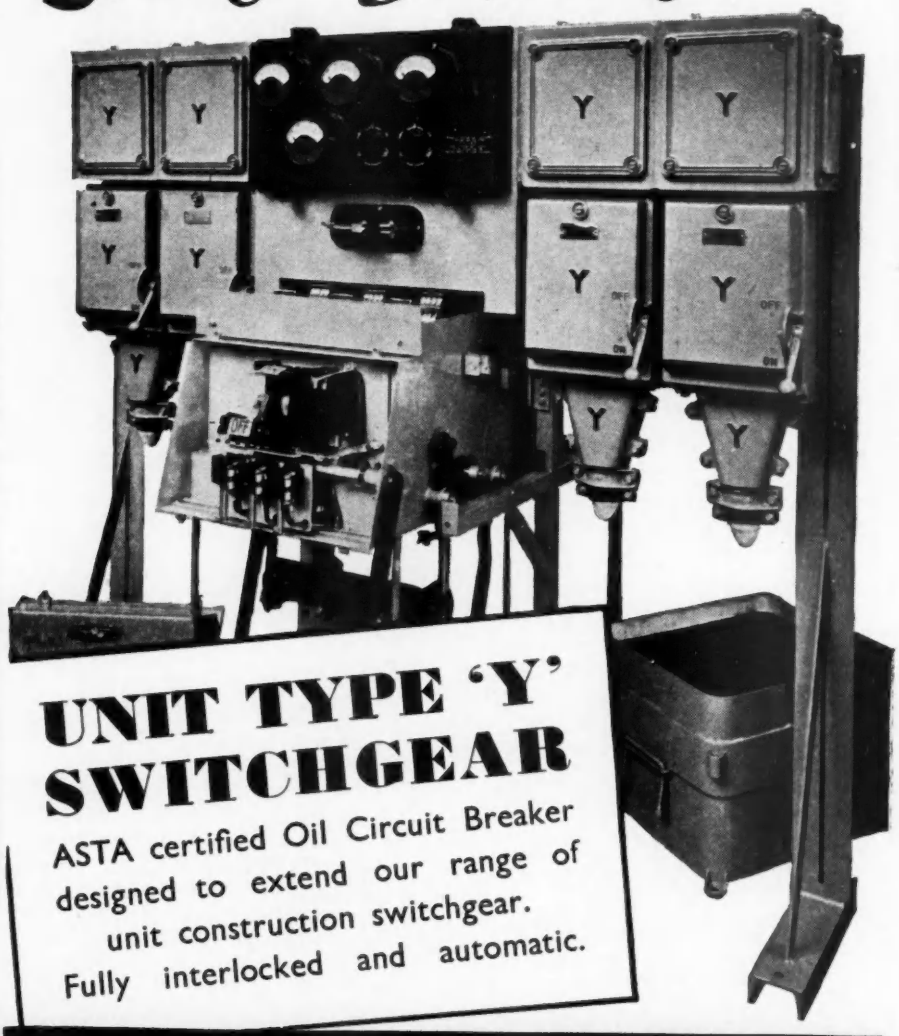

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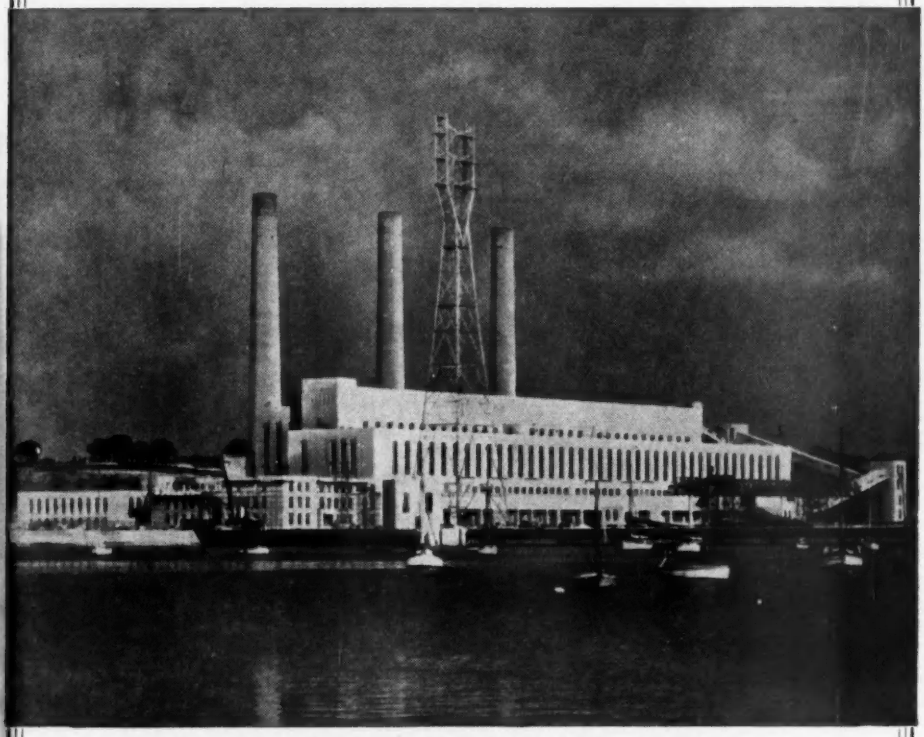

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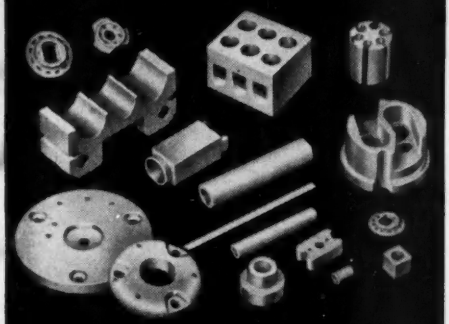

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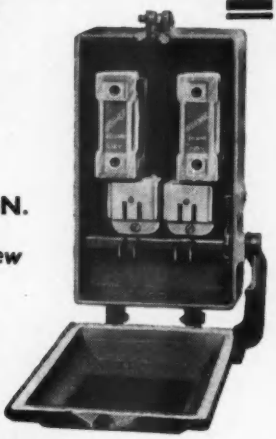

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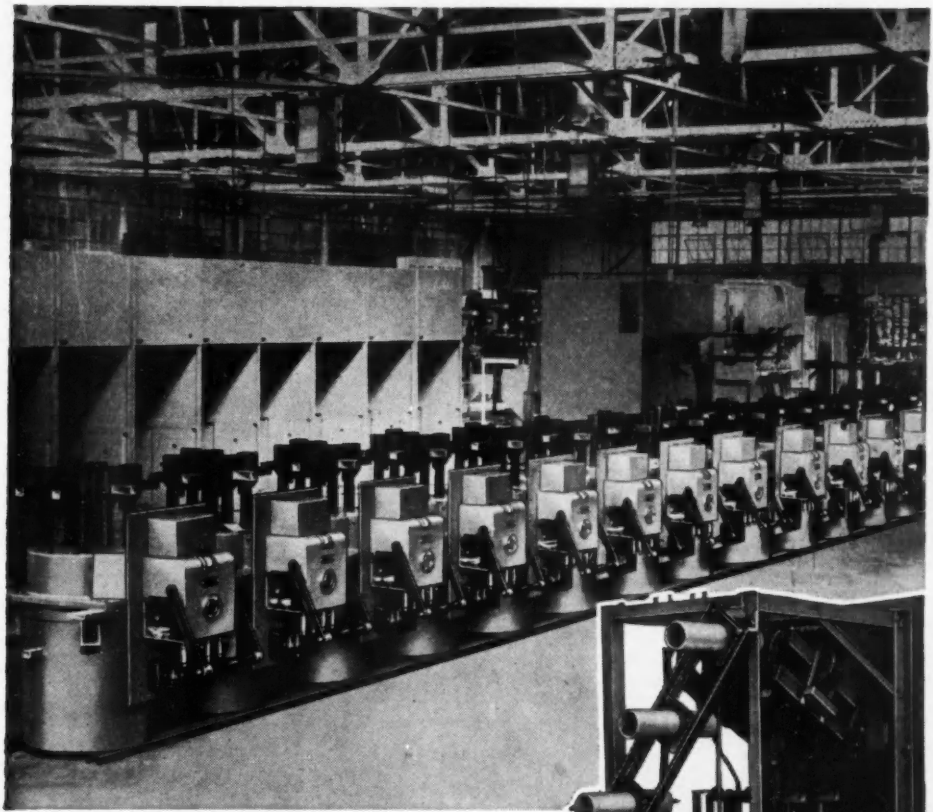

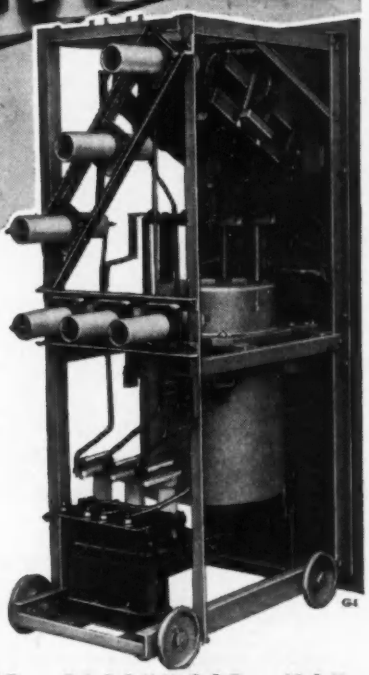

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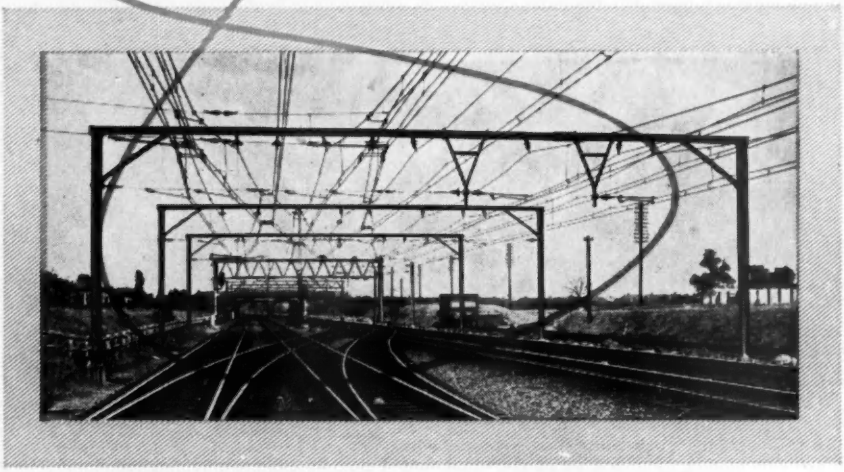

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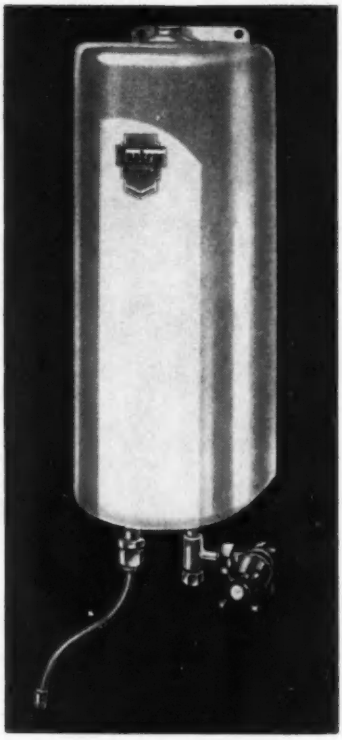

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I.C.I. cadmium copper wire is especially recommended to the attention of traction engineers.

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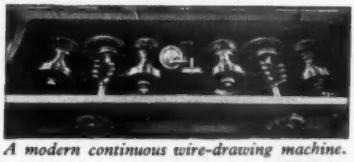

A modern continuous wire-drawing machine.

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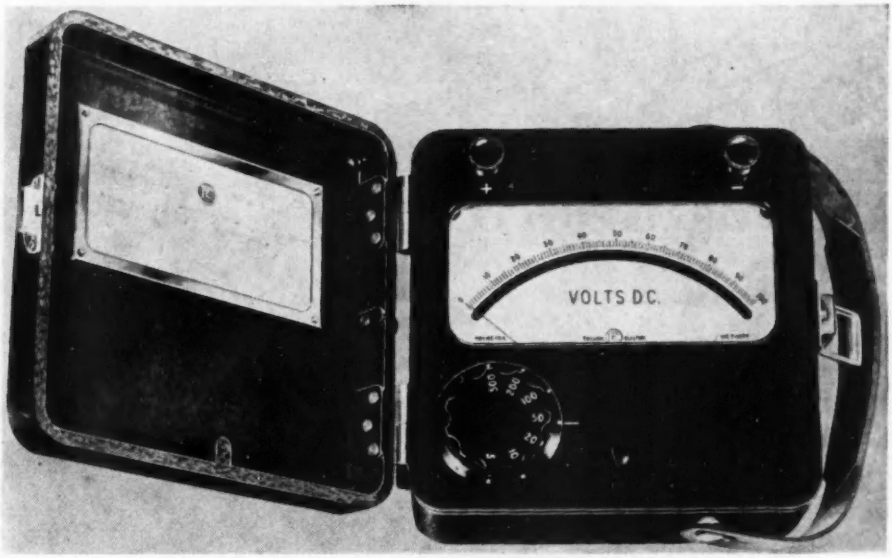

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A wide range of portable measuring instruments is being manufactured by 'English Electric' for laboratory and industrial application where a high degree of accuracy is essential. In addition to the moving-coil voltmeter Type U.I.C. (illustrated), the 'English Electric' range covers moving-coil ammeters, moving-iron volt-meters and ammeters, and rectifier-operated moving-coil instruments for AC/DC operation.

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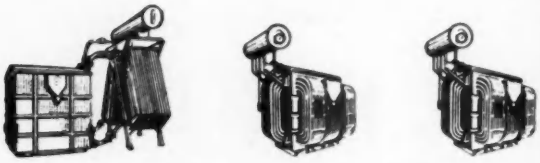

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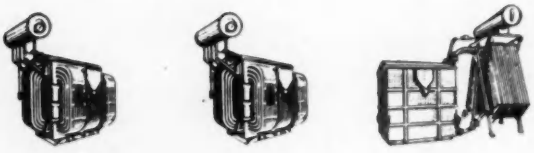
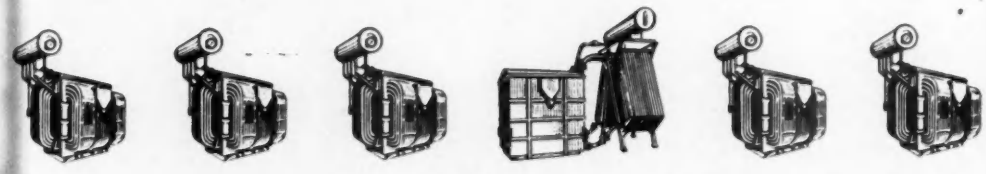


TRANSFORMERS TOTALLING 100,000 kVA



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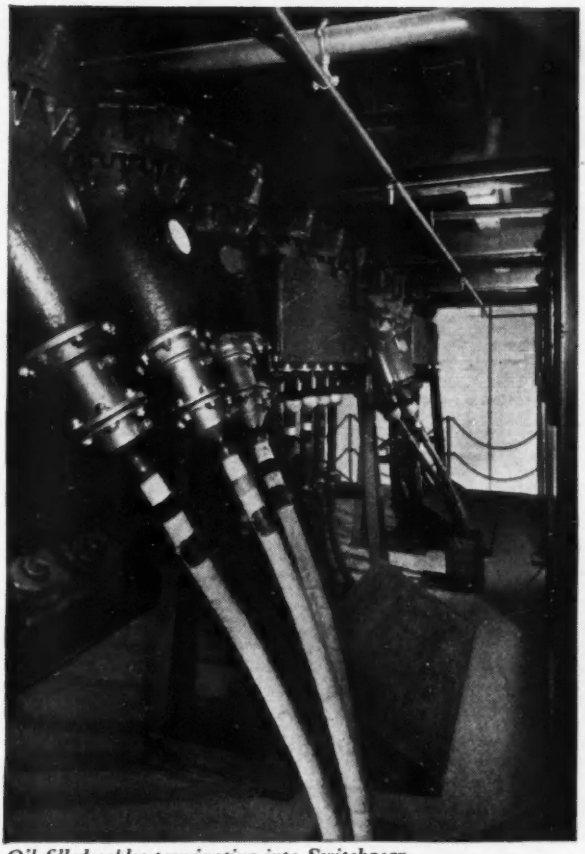
ELECTRICAL ENGINEERS AND CABLE MAKERS

ONE SURE FACT ABOUT CABLES



Oil-filled cables terminating into Switchgear

IF

you need cables
of any type,
in any quantities,
for any installation,
be sure of *one* thing:
if you choose to deal
with any firm listed
below you will
know for certain
that the standards
of design
and quality are
the highest possible,
because they are
standards set,
rigorously kept and
constantly reviewed
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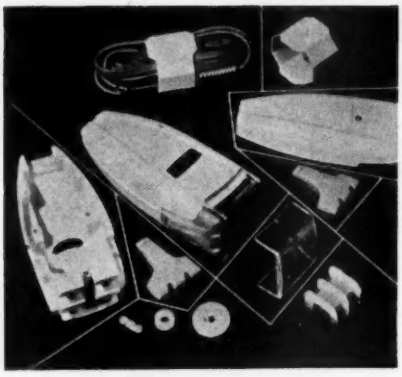
ask your moulder...

This is the second in a series of announcements designed to assist Buyers in purchasing plastics—moulded articles or components.

One point on which you will need assurance — all the more if you are a large consumer with a number of moulding contracts — will be the versatility of your moulder. The range of his equipment will interest you, not only because his ability to produce a good job at a good price may be influenced by it, *but also because it is a much simpler matter for you to deal with one moulder than with several.*

The question is tied up with the choice of materials, the nature of your jobs, the volume of output required. Can he, you ask, mould high-quality articles, large *and* small? . . . can he mould in both thermosetting *and* thermoplastic materials?

Many jobs could be carried out in any one of a number of materials. Others call for the use of different materials for different components. To a large extent your choice must depend on your moulder's advice. If it is to be worth having he must have had experience of all kinds of moulding materials and ideally he should be in a position to follow it himself — to mould almost any mouldable material. Check up on this essential aspect of service and choose only a moulder so experienced and equipped that he can offer you unbiased advice in this as in every other sphere of his work.



The assembly illustrated entails the moulding (in quantity) of eleven components in no less than seven different plastic materials, both thermosetting and thermoplastic. The customer found it a great convenience to be able to employ one experienced and versatile firm for the multiple job.
Mouldings by The Streetly Manufacturing Co. Ltd. for Remington Rand Ltd.

If in doubt, ask **STREETLY**

The Streetly Manufacturing Co. Ltd. makes mouldings in thermosetting or thermoplastic materials and specialises in long runs of highest quality mouldings. A high percentage of its regular output is of mouldings for manufacturers of electrical equipment and accessories. If you have a moulding job in view, call in Streetly for practical, down-to-earth advice.

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Switch over to Ashley

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These are designed to accommodate the 13 amp fused plugs to British Standard 1363, and are suitable for both ring main and non-ring installations, connected to A.C. mains, as specified by I.E.E. regulation No. 201C. Plugs are available fitted with cartridge fuses rated at 3, 7 or 13 amps to customers' preference.

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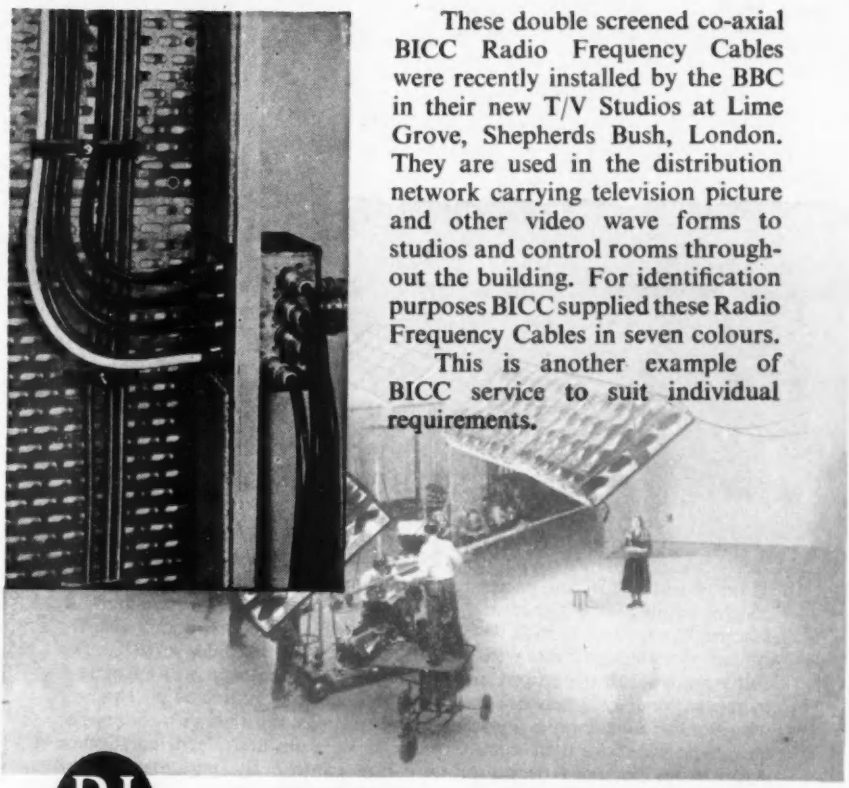
BICC R.F. CABLES
IN LIME GROVE T/V STUDIOS



These double screened co-axial BICC Radio Frequency Cables were recently installed by the BBC in their new T/V Studios at Lime Grove, Shepherds Bush, London. They are used in the distribution network carrying television picture and other video wave forms to studios and control rooms throughout the building. For identification purposes BICC supplied these Radio Frequency Cables in seven colours.

This is another example of BICC service to suit individual requirements.

B.I. Callender's

RADIO FREQUENCY CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
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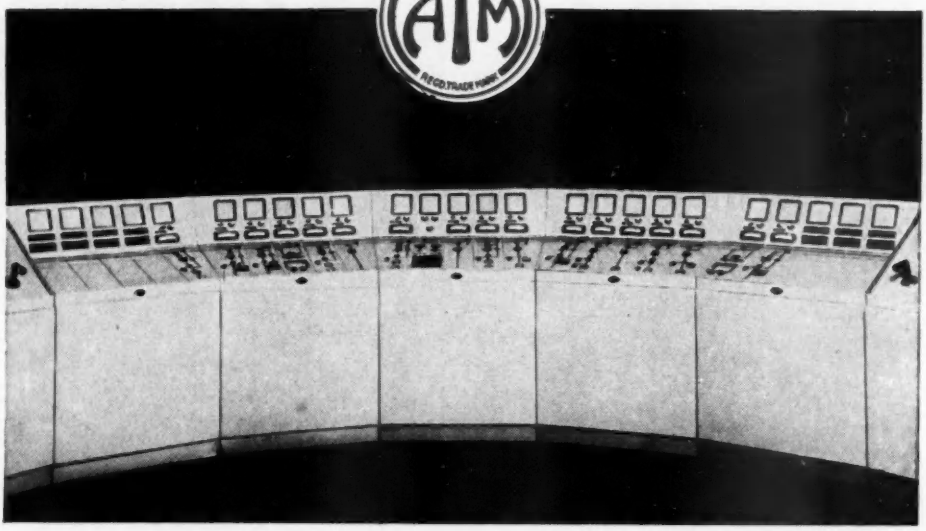

Portion of the Croydon control desk showing "A.T.M." miniature direct wire control positions.

REMOTE CONTROL

FOR POWER DISTRIBUTION NETWORKS

Croydon Power Station is one of the latest to be commissioned in the British Electricity Authority's supply network, which is one of the largest of its kind in the world. This new power station is equipped with "A.T.M." remote control equipment designed and manufactured by Automatic Telephone & Electric Company Limited, who built and installed the first comprehensive system of miniature direct wire control. This was at Salisbury in 1946. The entire sequence of operations involved in switching the output of the station to the national grid network is under the finger-tip control of an engineer who has also a clear indication of all meter readings, together with continuous automatic supervision of circuit breakers, isolators and alarm conditions. Apart from the convenience of miniature control, the equipment offers economic advantages both in space saving and cable costs.

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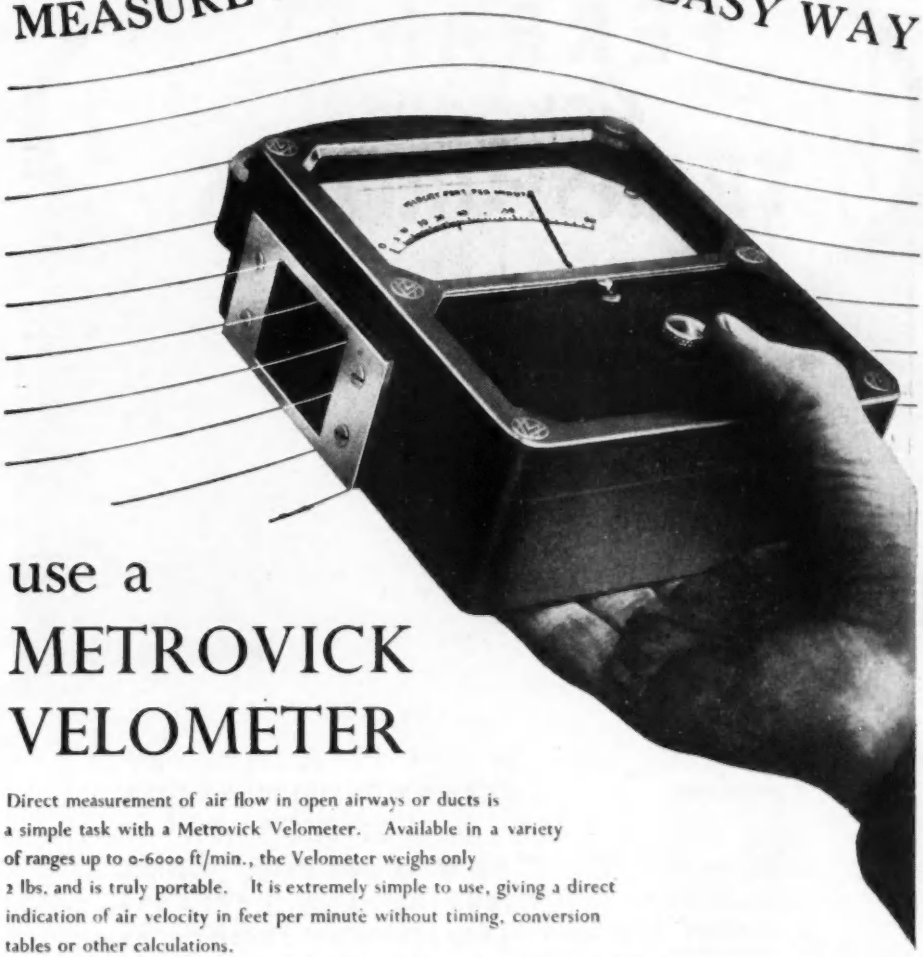
MEASURE AIR-FLOW THE EASY WAY



use a METROVICK VELOMETER

Direct measurement of air flow in open airways or ducts is a simple task with a Metrovick Velometer. Available in a variety of ranges up to 0-6000 ft/min., the Velometer weighs only 2 lbs. and is truly portable. It is extremely simple to use, giving a direct indication of air velocity in feet per minute without timing, conversion tables or other calculations.

Metrovick Velometers are precision built and each is individually calibrated and tested. Full technical details are available upon request.

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METROVICK *Velometers for air flow measurement*

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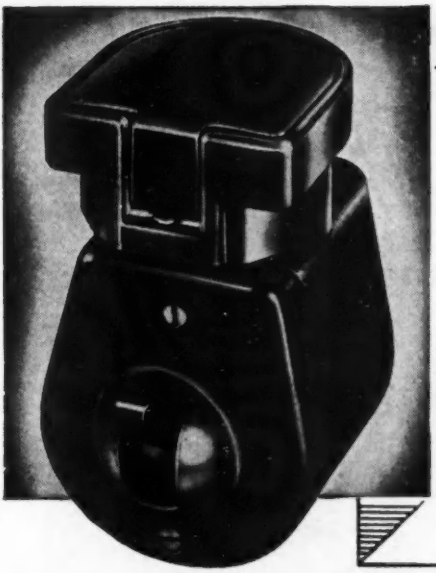

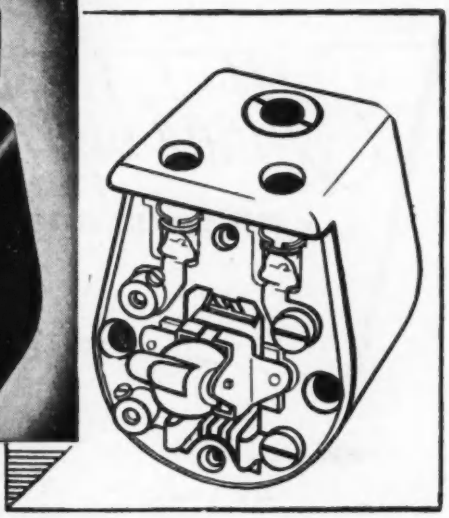

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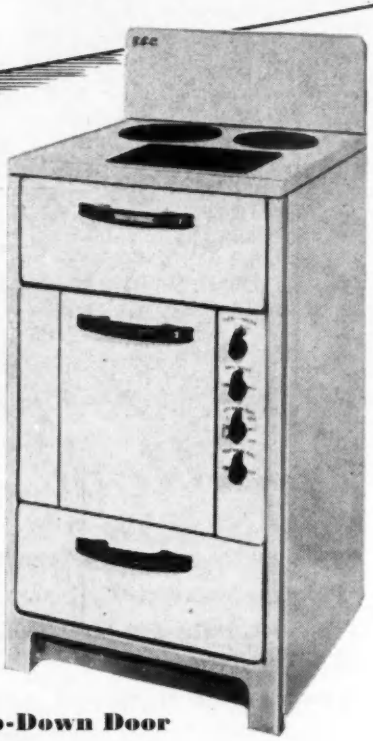

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★ **In Two-Tone Ivory or Cream and Green**

★ **Finished in Acid-Resisting Vitreous Enamel**

★ **Extra large Oven Thermostatically Controlled**

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★ **Counter Balanced Drop-Down Door**

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ELECTRICAL TIMES

Vol. 120 No. 3117 THURSDAY 2 AUGUST, 1951

PUBLISHED EVERY THURSDAY

SIXTIETH YEAR OF PUBLICATION

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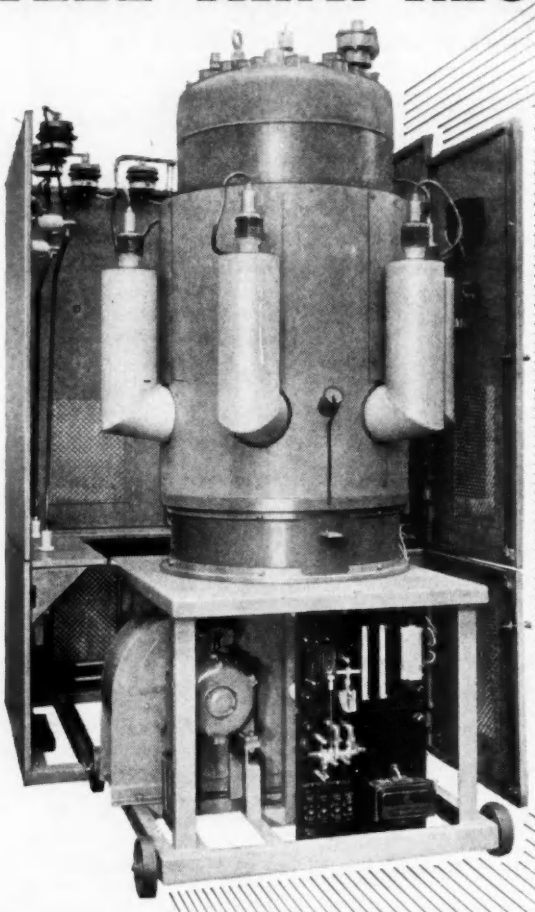

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Editorial

EMERGENCY CONDITIONS

AFTER one blundering and misinformed question on the liabilities of supply authorities for breach of the 1937 regulations regarding continuity and declared conditions of supply, Mr. Nabarro returned to the attack at question time in the House last week. On this occasion he was better documented and elicited from the Minister the answer that since load cuts are only made when excessive demand would cause a breakdown, this constituted an emergency which exempted the authorities from liability under Regulation 35. Consequently, consumers would not be entitled to compensation for loss or damage suffered. On being pressed further the Minister said if any doubts remain, it is open to anyone affected to go to the courts for a ruling. While no one can be happy about the present position under the regulations, it is probably the best compromise available. Since all consumers have suffered in some measure from load cuts, a right of compensation would lead to chaotic conditions for which in the long run consumers themselves would most certainly have to pay. It would be a simpler matter to alter the 1937 regulations and no doubt this is the step the Government would take if Area Boards were faced with any such problem. Such a change would undoubtedly remove all control over supply conditions, which no one would agree to be a desirable step. So please, Mr. Nabarro, let sleeping dogs lay.

EXPLODING A THEORY

THE use of hydrogen for cooling large machines has been well established in the U.S. for a number of years. In Britain, although it is no novelty, it is not yet in general operational use, and in consequence its advantages are not so widely understood as might be. An argument which has frequently been advanced against hydrogen is the risk of explosion in the case of leaks developing. Elsewhere in this issue we publish an article which deals with the matter from the standpoint of the theoretical advantages to be gained and includes an examination of the risks to be expected. From research results obtained by tests at Buxton it seems pretty clear that the chances of obtaining a mixture within the explosive range are so slight that they may almost be considered negligible. Furthermore, the results of tests show that, even if an explosion did take place, the maximum pressures to be expected lay well within the capabilities of a shell of reasonable thickness as designed on the basis of normal mechanical considerations. It seems, therefore, that the explosion danger can follow a number of other one-time bogey-men of the electrical industry—another theory exploded.

PER ARDUA AD A.S.T.A.

THE general release of a number of publications by the Association of Short-Circuit Testing Authorities will assist in lifting a part of the veil which—by chance, rather than design—has enshrouded it almost since its inception. The chief objects of A.S.T.A.—standardisation of conditions for the testing and certification of switchgear at the different stations—were widely publicised in 1939, when it had been in existence barely a year. Since then, however, little has been heard of it, even though its initials have become common currency wherever breaking capacity ratings are discussed. To knit together into one organisation a series of testing stations belonging to rival manufacturers, and to ensure that gear made by other manufacturers gets a fair, unbiased, and above all, confidential treatment, is no mean feat, and any organisation which had achieved as much might

be forgiven a fairly strident blowing of its trumpet. A.S.T.A. however, seems to incline towards the medical outlook. Doctors may not talk about their patients, and neither do they advertise. The general release of these hitherto restricted publications may be the equivalent of the discreet brass plate.

B.S. SUBSTITUTE

ONLY switchgear manufacturers can really appreciate the part which A.S.T.A. has played in the development of British switchgear. Without some measure of standardisation in conditions and interpretation of results, many a circuit-breaker might be regarded as "tested" on the strength of a few lucky shots. Without the absolute secrecy of test results guaranteed by A.S.T.A., few manufacturers would care to entrust their new designs to another manufacturer's plant, and the proportion of proved switchgear would be smaller than it is. Hitherto, switchgear manufacturers themselves have been the only ones concerned, but the growing practice of requiring tests on fuse gear opens up the wider field of those needing detailed information regarding actual test requirements for particular types of gear. A.S.T.A.'s publications on the subject—reviewed elsewhere in this issue—should be found exceedingly useful pending the issue of appropriate British Standards, many of which do not seem likely to be available for some time to come.

MECCA

WE who have lived with electricity for so long are apt to take it for granted and find difficulty in assessing the revolution that can be wrought by its introduction into backward areas. A welcome reminder was given in *The Times* last Saturday in an account of the changes that have taken place in Mecca during the last 25 years. True, the modernisation goes far beyond the bounds of electricity supply, yet it is clear that without this readily available source of power other developments would be greatly restricted. The author speaks of shops piled high with electrical apparatus and radios, of air-conditioned villas and of short-wave radio to the Muslim world. In the colonnades adjoining the Sanctuary large electric fans mitigate the heat, lighting lengthens the hours of devotion, and even the call to prayer is made over loudspeakers. The most vital change, however, is in the introduction of piped water supplies, while the greatest distinction on electricity is conferred by the use of a motor-driven pump at one of the sacred wells.

Meteor

THIS WEEK'S PHOTO

KILMARNOCK power station, now operated by the South West Scotland Division of the B.E.A. was, prior to vesting day, owned by the Ayrshire Electricity Board. Its history dates back to December 17, 1904, when the station was put into commission by the Kilmarnock Corporation, just a year after the date of placing the contracts! At the same time a tramway system was inaugurated. Initially, the Greenholm Street Works housed four 200 h.p. Bellis engines coupled to dynamos supplied by Dick, Kerr and Co., with a battery room on the north side of the engine room, containing 254 Tudor cells rated at 360 Ah. There were three Yates and Thom Lancashire boilers working at 160 lbs pressure. A few years later two Bellis and Morcom 400 h.p. engines, together with associated Dick, Kerr dynamos, were added.

By May, 1923, when the undertaking was taken over, along with that of Ayr, by the Ayrshire Electricity Board, the station's capacity amounted to 22,000 kW, made up of five turbo-alternator sets, one each of 12,500 kW, 5,000 kW, 2,500 kW, 1,500 kW and 500 kW., together with Babcock and Wilcox boiler plant.

Since that time various additions and alterations have been made, and at the present time, the installed capacity totals 85,000 kW, made up of two 12,500 kW and two 30,000 kW B.T.H. impulse-type turbo-alternators. The low-pressure boiler plant comprises four C.T.M. Babcock units of 50 klb/hr evaporative capacity and two Clarke Chapman 60 klb/hr boilers, steaming conditions being 250 lb/s.i.g. at 650° F. On the high pressure side there are five International Combustion "Lopulco" tri-drum boilers, each of 150 klb/hr evaporative capacity, and steam conditions 420 lb/s.i.g. pressure at 825° F. All boilers have chain grate stokers.

During the twelve months ended March 31 last, the station sent out 385·009 million units, its thermal efficiency figure being 19·10%.

ELECTRICAL TIMES POWER STATION SERIES
No. 75 Kilmarnock

Our readers' views . . .

Electro-Luminescence

IN the article on Luminous Capacitors in Electrical Times for July 19, there is a reference to my theory of electro-luminescence which is very misleading. The writer states that I view the effect as a phosphorescence due to release of trapped electrons by the applied field. As he points out, such an explanation cannot explain the sustained production of luminescence during the duration of the applied a.c. field and I would like to indicate the more adequate explanation which is given in the original text (*Luminescent Materials*, Garlick, Oxford University Press, 1949).

The fields applied to the Luminous Capacitor are obviously too small to produce direct ionisation and excitation of luminescence (they are about 10,000 V/cm. whereas 10^6V/cm. would be needed for direct ionisation in the phosphor). However, it is well known that such fields can eject trapped electrons. If these electrons are then accelerated by the field in their free state in the material they will liberate further electrons and also produce luminescence when they reach energies of a few electron volts. This process will then become self-sustaining by further electron accelerations and ionisations. Even if the Capacitor is kept in the dark for several days there will still be a sufficient number of electrons in traps to initiate the process on application of a field. It would be of considerable theoretical interest to see whether electroluminescence is produced by application of a field to these materials after they have been heated or irradiated by infra-red light to remove all trapped electrons.

G. F. J. Garlick

PHYSICS DEPARTMENT, UNIVERSITY OF BIRMINGHAM. *Ph.D., F.Inst.P.*

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Uncertificated Engineers

IN common fairness I would reply to the letter by A.M.I.E.E. in your issue of the 26th inst., in defence of the uncertified engineer. To save any misunderstanding the writer is not in that category himself, inasmuch as he is a member of a chartered institute and holds an engineering degree. Should these facts be doubted, proof can be sent direct to A.M.I.E.E. upon request.

There are a greater proportion of uncertified engineers in the country and they are all doing a very good job of work. For A.M.I.E.E.'s information, membership of the I.E.E. is not documentary proof that the holder is above reproach. Also, the I.E.E. have several grades of membership, i.e., companions, etc.; some of whom are not engineers at all.

In the last few lines of your article, you state that the uncertified are all good chaps in their own opinion. Quite apart from the unkindness of this remark, I have always found a great deal of humility and a desire to help one another during my 17 years in the industry.

In conclusion, I would pay a tribute to an uncertified engineer whom I had the honour to serve during the last year of my apprenticeship, i.e., the late Mr. Ross of the B.T.H. Co., Ltd., who was in charge of the entire construction at the Stourport Generating Station. Also I would ask A.M.I.E.E. to consider the pioneers of the electrical industry; was Michael Faraday a member of the I.E.E.?

KIDDERMINSTER *Lindsay Crawford*

[Our correspondent is not quite fair in the remarks he attributes to A.M.I.E.E. The expression actually used was "we are all good chaps in our own opinion"—a very different meaning.—Ed.]

◆ ◆ ◆

WILL A.M.I.E.E. say whether, after resigning, for one reason or another, membership of the I.E.E., one again joins the body of uncertificated engineers who are not so good at the job as the certificated? Or does one still bask in the glory of past certification and remain as good an engineer as when "certificated"?

BROUGHTY FERRY *A.G.C.*

◆ ◆ ◆

A SOAP powder in a plain carton may be as good—or even better—than one bearing a well-known name, but it will never command the same price as the labelled article—one has only the vendor's word for its quality. There is a parellel in the engineering industry and it is a subject upon which agreement will never be reached.

LONDON *Neutral*

2 AUGUST, 1951

Supply for CEMENT Making

Factory distribution for continuous working is a feature of the new Shoreham Plant of British Portland Cement Manufacturers Ltd.

The new works fits neatly in a quarry in the West Sussex downland

STREAMLINING of industrial processes, so prominent a feature of post-war factories makes great demands on the ancillary electrical services, which have to fit in with whatever pattern the mechanical and chemical layout imposes. The techniques by which electrical engineers can meet these requirements at minimum cost were well demonstrated recently, when we were privileged to visit the newly reconstructed Shoreham Works of the British Portland Cement Manufacturers Ltd.

Basically the process of cement manufacture is very simple. An intimate mixture of finely divided chalk and clay, in a ratio of about 3·8 to 1 is calcined at a temperature of 2,650° F. A "clinker" results, and this is subsequently ground to a fine powder (90% through a 170 mesh for ordinary cement) and a little gypsum added to give a delayed setting characteristic.

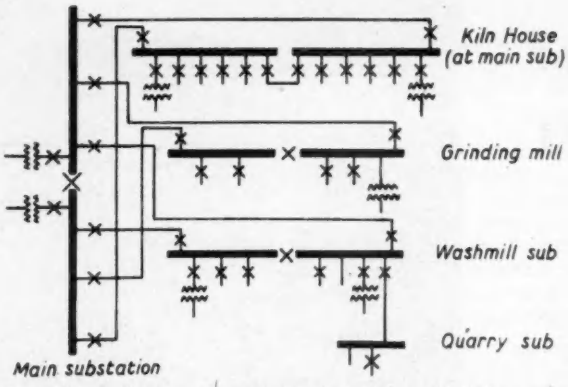
At Shoreham, the stages of the process are as indicated on the flow diagram (p. 195). Clay is excavated some three miles from the works, and is pumped as a slurry thence through 8 in. diameter pipelines to a storage tank adjacent to the chalk washing plant. The chalk is obtained from a quarry next to the works and after preliminary crushing to about 10 in. cube size, is fed by gravity shute to washmills, where it meets the clay slurry. In the three series of mills the slurry-chalk mixture is passed through successively finer screens, the chalk being ground up in the process. Flints in the chalk are removed at this stage, and are the one by-product, being sold to pottery manufacturers after washing.

After this stage, the slurry is taken to a series of mixing tanks, where necessary adjustments are made to its composition based upon the results of chemical tests. The slurry is then taken to storage tanks preparatory to being fed into the rotary kiln. The general form of these 360 ft long kilns can be seen from the illustration : the slurry is fed in at the higher end, at a carefully controlled rate, while at the other end pulverised coal is blown in with hot air obtained from the kiln hood. The resulting clinker is passed to another rotating cylinder—the cooler—and taken to a store. From here it is taken for grinding and packing as may be convenient.

The kilns are the principal machines in the process, and they are designed to run for 95% of the year without a shut-down : all other plant, and in particular the electrical equipment, must correspond if the economics of production are to remain balanced.

Electrical Supply

Total motor horse power installed at the Shoreham works is about 10,000 and the anticipated maximum demand 5,100 kVA. Brighton power station is only a short distance away, and a supply is conveniently obtained from the associated Fishergate substation.



Extensive duplication of supply is adopted throughout the works distribution system as is apparent in this schematic of the main connections. Incoming supply is at 33 kV, main distribution at 3 kV, with step-down in substations to 440 V

Duplicate 33 kV lines are used feeding into two 5 MVA delta/star transformers (British Electric Transformers) which reduce the voltage to 3 kV. To take care of voltage variation, which is considerable at times, on-load automatic tap-changing equipment is provided for the transformers, covering the range + 6% to − 9% in steps of 1·5%.

Protection of the 33 kV line is provided by overload and earth leakage relays at Fishergate substation, and by neutral point displacement relays at the works. Fault-throwing switches are incorporated which, in the event of a fault, intertrip the 3 kV o.c.b., preventing reclosure and feed back while the system is unhealthy.

Supply to the clay plant, which is some three miles from the main works, is taken by a spur from a local S.E.E.B. 11kV ring main. One 600 kVA transformer is installed to give a 3 kV supply. The importance of continuity of working in the economics of cement production has already been mentioned. Provision of a duplicate 33 kV supply is of course a step in this direction, and this duplication is continued throughout the works distribution system. So steady a load is attractive to the electricity supply industry, but the operating schedule of the Company is such that it becomes more welcome still. Only the kiln need be kept continually at work: as the flow chart shows, storage facilities are provided between most other processes. It is possible, therefore to arrange that some heavy energy consumers such as the grinding motors are not used during peak load hours.

Load control meters are installed in the main substation, arranged so that should the actual maximum demand exceed the predetermined maximum demand in any half-hour, visual and audible warning is given to the substation attendant.

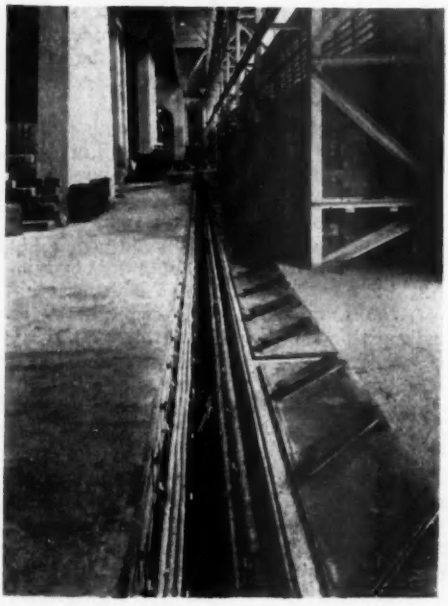
Works Distribution

Duplication of supplies as a precaution against shut-down is the principle followed throughout the works distribution system, which is mainly run at 3 kV, as shown in the accompanying line diagram. The main substation has three switchboards, the first of which is a 14 panel unit incorporating duplicate metering equipment, and also providing direct feeds to washmill and grinding mill substations. The other two switchboards are seven panel assemblies each supplying one kiln and its associated apparatus.

All the 3 kV switchgear is of the air insulated vertical plugging type, with a breaking capacity of 100 MVA (B.T.H.). A single bus system is used and the bus-bar interconnectors in the various substations are normally operated closed. Transformers are invariably mounted outside the substations, to reduce fire risk.

In the washmill substation there is a 10 panel

Henley cables run in this duct along the kiln house

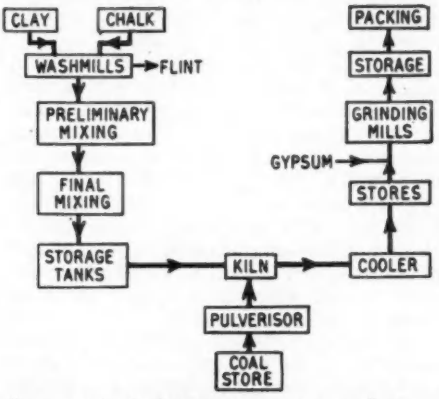


board including control of the 0·04 sq. in. feeder for the quarry substation; this in turn has a simple two-panel board to supply an excavator with provision for future extension and special earth leakage protection to comply with the Mines and Quarries regulations. The grinding mill substation has an eight panel board.

Medium Voltage Supplies

Although all the large motors are 3 kV working, there is a considerable load made up of auxiliary motors, lighting, etc., running at 415 V 3-phase. 600 kVA (English Electric) transformers are used to feed this load, which is controlled by air circuit breakers of 25 MVA breaking capacity (B.T.H.)

Earthing has proved a problem, because of



Storage capacity between stages in manufacture is a feature of material flow at the Shoreham Works

the extensive hard chalk subsoil. However, the River Adur flows near the works, and a central earth connection has been made on its banks, four 6-in. dia cast-iron pipes, 10 ft long at 10 ft spacing giving an earth resistance of less than one ohm for each pair of electrodes. Each pair is joined by copper strip, and then connected by lightly insulated cable to the earth bar in the main substation. Facilities are thus made available for tests and maintenance on one half of the earthing system, whilst the other is still effective.

Motors and Control

All the 3 kV motors are protected against single-phasing, overcurrent and earth leakage by thermal type relays, and are of standard drip-proof pattern, but in other details they vary considerably. Those on the washmills, for instance, are 360 h.p. slip-ring units, mounted in the open on a bridge over the mill. Control is from a room placed to give a clear view inside all the mills, an important consideration from the safety aspect.

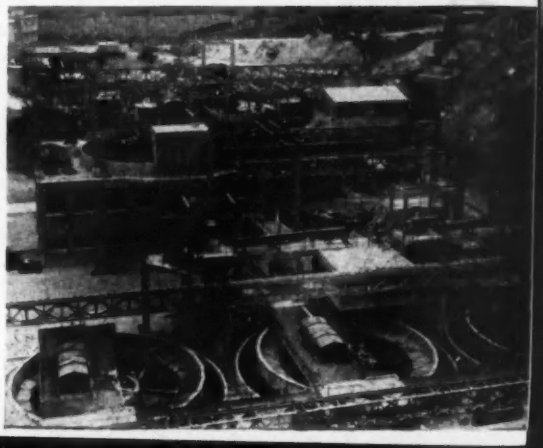
In the kiln house there are three 3 kV motors for each kiln. One of these is a two-speed fan motor, 170/52 h.p. operating the i.d. fan, which has contactor control gear with timing relays to ensure that the low-speed winding is used for a minimum time after starting, and that there is another time limit on the change from low to high speed. Another interesting motor in the kiln house is a 170/68 h.p. main kiln driving motor, with a speed range 592/230 r.p.m. obtained by rotor resistance control.

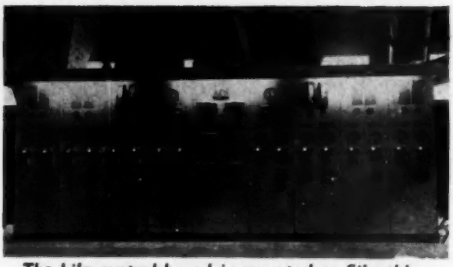
The largest motors are in the grinding mill, these being auto-synchronous induction motors with cartridge type ball and roller bearings, run over-excited to give a power factor of 0·95 leading. Two of these motors are rated at 1,200 h.p., 970 kVA and a third at 800 h.p., 600 kVA. A fourth mill had a 400 h.p. drive.

An interesting example of central control is provided in the kiln house, where apart from controls for the motors, there are various measuring instruments and monitoring lights to indicate positively that slurry is being fed to the kiln. Alarms are incorporated to give warning of any trouble. The board, which is 18 ft. long, is mounted on "Silentbloc" pads to damp out vibration.

There are in all some 200 motors running at 415 V, including all drives up to 100 h.p. Most of these machines are of totally enclosed fan cooled construction because of the dustiness that prevails to some extent even in this up-to-date plant. Direction-line starting is used for squirrel cage machines, and stator/rotor starters for the slip-ring motors. George Ellison oil-filled starters are employed, and an ammeter is included as a standard fixture. Additional red pointers are provided on these meters and are set at the normal safe full load reading. Unskilled operators then have a simple guide to possible trouble and contact

Open air motors above the washmills are clearly seen here





The kiln control board is mounted on Silentbloc pads to damp out vibration

an electrician if the marked reading is exceeded.

Lighting methods vary considerably throughout the works and offices according to the task involved. Fluorescent lighting is installed in the offices while the grinding mill has mercury discharge lamps with metal filament lamps for colour correction and to provide an emergency supply. Mercury discharge lamps are again used in the kiln house, where the height of the roof makes rise and fall fittings necessary for maintenance purposes.

Separate 25 kVA, 415/240/110 V single-phase transformers are provided for the lighting circuits, the two secondary windings having their centrepoints earthed. The 110 V supply is taken to socket outlets placed round the works for use with portable tools : non-interchangeable plugs are used in connection with these 55 V to earth circuits. All circuits on this part of the system are run in v.r.i., s.w.a. cable, except within the offices where conduit is used.

The other extreme of voltage in the works is reached in the Sturtevant precipitators, which are mounted at one end of the kiln house, and effectively remove dust from the gases before they are discharged to the atmosphere; the voltage on the wire electrodes is between 30 and 50 kV negative to earth. A limit of 0·4 grains/cubic foot has been placed on chimney gases. Dust removed is not wasted, but is returned to the kiln.

An impression of the size of the kiln house and of the rotary kilns is given by this view taken along its length

Installation and Maintenance

With continuity of supply, the main requirement of the process, maintenance must essentially be preventive, and the whole system at Shoreham is planned with this in mind. A patrol system of electricians is arranged and a daily routine of inspection is laid down for important items of equipment and potential bottlenecks. The advantages of the motor ammeters in drawing attention to possible trouble have already been mentioned.

To back up this system, and to economise in time when trouble occurs, a comprehensive card system is being developed. Each motor and starter and other main item of electrical equipment is to have a card recording name-plate details, bearing particulars, etc., and space for notes on tests, overhauls and incidents. For major units of equipment—cranes, for example—folders are being prepared so that all the relevant information is available in one place. Cards will also indicate the plant numbers of suitable spares.

The system is to be extended by the preparation of cards for control circuits. On these will be shown a schematic diagram of the circuit, and will carry details of a trouble-chasing test routine. These cards should be particularly useful to electricians working on the comprehensively interlocked conveyor system.

Portable tools are to be regularly tested, especially with regard to the current-carrying capacity of their earth conductor.

Care has been taken that the switchgear is as dust-tight as possible and double doors with gaskets are used where they are practicable In the grinding mill, a separate motor room is provided, and the large motors installed there and their associated gear boxes, are provided with barring gear to facilitate maintenance work. The starters of these motors are rated to deal with four starts following immediately one after the other, to allow jams to be dealt with.

Earthing in Factories

Safety considerations applied to electrical plant

By S. WOODHOUSE, A.M.I.E.E., Assoc.I.Mech.E.

PREVENTIVE measures taken against the risk of electric shock and fire by means of direct "earthing" depend for their effectiveness on sufficient current being able to "flow" along the earthing conductors to melt a fuse or trip a circuit-breaker immediately a fault to earth occurs. On medium voltage circuits having one point of the system solidly earthed, it is usually relatively easy to maintain a "consumer's earth resistance" low enough to pass sufficient fault current to operate the protective gear for small and medium-sized machines, but difficulties arise with the larger machines.

Motor Protection

Let us consider the conditions necessary for the earth fault protection of a 400 h.p. 3-phase induction motor on a 400 V supply. The full load current will be about 525 amps, but, if the motor has to cope with intermittent overloads, it may not be possible to have the overcurrent trips set below 25% overload—in this case 650 amps. In the usual case, where the secondary of the supply transformer is earthed at the neutral, the voltage between any line and earth will be 230 V and, therefore, the impedance of the fault circuit must not exceed $\frac{230}{650}=0{\cdot}354$ ohm. Now, even where the earthing is completed at the earth plate to which the transformer neutral is connected, some difficulty may arise in maintaining such a low resistance (the reactance of the cables will be negligible). Also, the initial resistance of the fault may be appreciable and a condition could arise whereby the current passing is insufficient to operate the circuit-breaker. Having regard to the fact that time lags will be necessary in order to prevent the trips operating on momentary overloads, the actual value of earth resistance should be well below the value given above if rapid earth fault clearance is to be obtained.

Another aspect of this matter which is not without interest is the power dissipated at a local point of high resistance due to a bad contact in the earth circuit. If, due to a bad contact, the resistance is increased to, say, 0·36 ohm, the power dissipated at this point in the event of an earth fault would be equal to $\left(\frac{230}{0{\cdot}36}\right)^2 \times \frac{0{\cdot}006}{1{,}000}=2{\cdot}47$ kW. This would cause considerable heating to take place and yet the overloads would not operate, probably causing an outbreak of fire.

In the event of the transformer earth plate not being available for terminating the earthing continuity conductor, the earthing circuit would have to be connected to a separate plate. The consumer's earth resistance would depend to a large extent on the resistivity of the medium surrounding the earth plate and the total fault path would include two earth plates, thereby considerably increasing the resistance. In the author's opinion this method is unsatisfactory except for comparatively small installations, owing to the difficulty of maintaining earth plate resistances less than about 0·5 ohm.

Earth-Leakage Protection

In addition to the conditions stated above, earth-leakage currents, due to high resistance faults or to low overall insulation resistance, may flow for considerable periods and cause the frames of machines, switchgear, etc., to be at a potential sufficiently above earth to incur grave risk of electric shock to anyone touching the equipment. Such leakage currents are also dangerous in factories where inflammable materials are present in that they introduce a fire risk.

As a result of legislation governing the use of electricity in mines and in quarries, earth-leakage protection on circuits above 125 V is now standard practice. For some years the subject has been of interest to factory electrical engineers and much experience has been gained in the design of earth-leakage equipment.

(*a*) CORE-BALANCE PROTECTION.—The core-balance method has been applied on main switchboards with considerable success. This system works on the principle that the algebraic sum of the currents in a 3-phase circuit under healthy conditions is zero. Thus, there is normally no flux produced in the core of the current transformer as shown in Fig. 1, and there will be no current in the relay. In the event of a fault, however, the out-of-balance

current produces a flux, causing a current to flow in the relay. This equipment can be designed to open the circuit if the current to earth exceeds 7½% of the rated current. Some years ago earth-leakage protection was developed for use with fused switchgear and was described in the *I.E.E. Journal*.* The secondary current in a core-balance transformer (or in the secondaries of three separate c.t.'s)

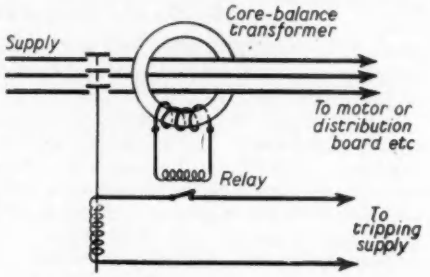


Fig. 1.—Schematic diagram of connections for core balance protection

is utilised to heat an element which, in turn, releases a striker pin from a container looking something like a cartridge fuse. The striker pin operates trip gear incorporated in a fuse-switch. Provision is also made for the switch to be tripped if one of the line fuses should melt, a striker pin being fitted to each fuse.

(*b*) COMBINED EARTH-LEAKAGE AND OVERLOAD PROTECTION.—It is convenient to use a core-balance transformer in conjunction with a circuit-breaker fitted with direct acting overload trips, but for high voltage or large medium voltage circuit-breakers, where the overload coils will in any case be operated through current transformers, earth-leakage protection may be obtained by connecting a relay between the star-points of the current transformers and the overload coils as shown in Fig. 2(a). Sometimes one of the overload coils is omitted as an overload between any two phases will operate at least one of the two remaining coils, and an earth fault or leakage will operate the earth-leakage relay. This arrangement is shown in Fig. 2(b).

With 5-amp current transformer secondaries and overload relays, and a 1-amp earth-leakage coil, the circuit-breaker would trip instantaneously on an earth fault equal to 20% of the full load of the current transformers: time-limit fuses shunting the overload coils do not retard the operation of the circuit-breaker on an earth fault.

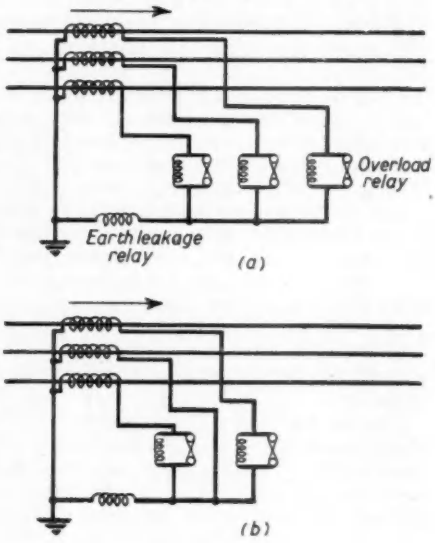
*Journal I.E.E., 1945, Vol. 92, Part II, No. 29, page 419.

(*c*) DIRECT-LEAKAGE PROTECTION.—Direct-leakage protection depends for its operation on the fault current in the earthing conductor energising the secondary of a current transformer which operates a relay, thus tripping the circuit-breaker as shown in Fig. 3. For this method to be successful the base of the motor, switch or transformer, etc., should be lightly insulated, or at any rate on a dry concrete foundation, so that the only metallic connection from the equipment to earth is the earthing conductor which passes through the core of the current transformer.

Portable Apparatus

One of the greatest risks of electric shock in factories arises from the use of portable tools on 230-250 V circuits. The earth wires of flexible cables quite frequently become detached from the plug or from the casing of the appliance, and even regular maintenance cannot altogether prevent the use of the equipment under such conditions. It is by no means unusual for the first indication of defective earthing to be brought to light by someone receiving a shock due to the insulation of the motor or the trigger switch having failed. Carbon dust settling on the brushgear can cause dangerous leakage currents to flow for some considerable time before actual breakdown occurs and the fuses melt.

Fig. 2.—Combination of earth leakage and overload protection



In the report of H.M. Chief Inspector of Factories for 1948, out of 628 accidents from electrical causes, 117 were due to portable apparatus or flexibles, and of these 16 were fatal. The figures for 1949 give 592 electrical accidents, of which 97 were due to portable apparatus or flexibles, 8 of these being fatal. That this matter has received serious consideration is evident from the recommendations contained in the B.S. Code of Practice CP 321.102 (1950), "Installation and Maintenance of Electrical Machines." In Section 3 it is recommended that: "In order to reduce the risk of dangerous electric shocks where small portable tools are used other than in earth-free situations, a voltage not exceeding 110 V, obtained from a double-wound transformer, should be used. Where practicable the mid-point of this low voltage supply should

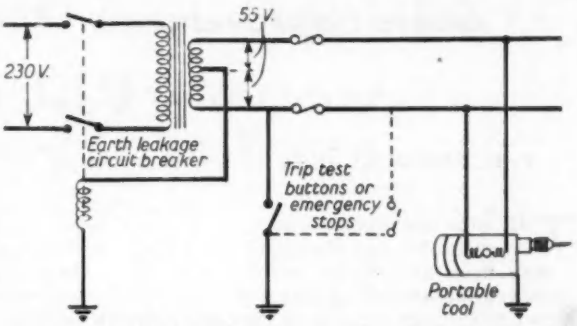


Fig. 4.—Earth leakage protection to give safety with portable electric tools working on low voltage

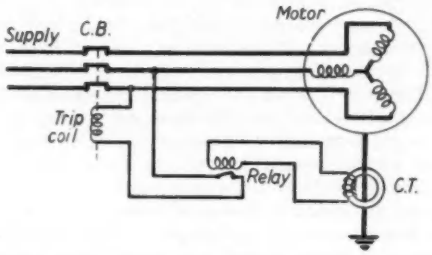


Fig. 3.—Connections for direct leakage protection

be earthed, thus further reducing the maximum voltage to earth at the apparatus concerned. Where the mid-point is so earthed a further precaution may be adopted of effecting this earth connection through a relay connected in such a manner that the operation of the relay interrupts the supply to the appliance in question, thus providing sensitive earth-leakage protection for the circuit."

Fig. 4 shows a circuit fulfilling the above conditions. Earth-leakage circuit-breakers can be obtained with trip coils designed to operate at 24 V (± 2 V) with about 200 ohms in the earth circuit, the operating current at this voltage being approximately 60 mA.

There must be many thousands of 230 V portable drills, grinders, etc., in use in factories, and it will probably be many years before these are replaced or rewound for 110 V. Also, the commutators and brushgear of some 230 V motors will be too small to give a satisfactory performance on a 110 V supply due to the heavier current taken. It may well be, however, that there is a field for double-wound transformers having a 1 : 1 ratio with a mid-point tapping on the secondary. If these transformers were also provided with suitable tappings to give 110 V at a later date, the changeover could be made gradually. During the interim period the earthing of the mid-point of the secondary would reduce the voltage above earth to 115 V and would thus give some measure of security beyond that at present obtained on a standard 230 V supply.

Personal Protection in Industry

AN interesting experiment in safety propaganda is being carried out this week and next in the welding department showroom of Thomas P. Headland, Ltd., 141 Lower Marsh, London S.E.1 (near Westminster Bridge). For one fortnight, the usual display of welding equipment has been removed from the showroom, and it has been filled with examples of personal safety equipment and literature covering most industrial processes.

The accent is on eye protection, and a wide range of goggles, eye shields and face masks are on show, together with some interesting test equipment for checking the strength of lenses. Apparatus of application to welding is continued in a range of gauntlets and safety clothing, and in a working illustration of the light transmission of various screen glasses. Finally, there is a collection of safety pamphlets suitable for works distribution.

The exhibition is strictly non-commercial, and has attracted the interest and co-operation of the Royal Society for the Prevention of Accidents. Apart from the sponsors, firms co-operating are J. and R. Fleming (armoured lenses), R.F.D. Co. (flameproof clothing), G. G. C. Megson (leather garments), Siebe Gorman, Chance Bros. and Plysu (plastic clothing).

Some improvements can be made in
PLUG DESIGN

F. R. SMEDLEY *puts the viewpoint of those who use them*

THE plug and socket system constitutes the univerally used method of connecting a wide range of portable, and semi-portable electrically-driven tools to the mains. Plug pin sizes and spacings are now almost completely standardised. A further step in the right direction would be a standard shape or pattern, and an agreed specification for the moulding. Moulding powders are available giving a high resistance to impact in the finished moulding. Plugs at the ends of flexible cables are frequently dropped on to hard surfaces, such as concrete floors, machine beds, etc., and due to such a fall, the cracking of a poor quality moulding can constitute a very real source of danger to the machinist, anxious to get on with the job in hand.

One or two makes of plugs moulded from rubber, have appeared on the market from time to time. While capable of standing up to a lot of abuse, it will be agreed that they are somewhat cumbersome. Kept free from cuts and nicks, a moulded rubber plug can have quite a long life, but for various reasons, the plastic-moulded plug predominates.

On the subject of sheathing the back portion of the live pins, there seems no agreement amongst the plug manufacturers. Frequently, a liberally designed plug having a shaped body forming a finger guard, will also have sheathed pins fitted. On the other hand, a skimpily designed plug will be found to be minus finger guard and sheaths on the pins.

Unexpected Combinations

Many manufacturers of plugs and sockets tend to overlook the fact that once on the open market, and in the hands of numerous users, all sorts of combinations of standard plugs and sockets eventually arise. Again, some designs of shuttered switch-sockets will not survive many attempts to force the plug in with the switch closed, the ultimate result being that the hard-pressed maintenance electrician removes the damaged shutter mechanism, and the remainder continues to function as an open switch-socket. The resultant combination of a badly designed plug and a mutilated switch-socket can have very unpleasant consequences for the unwary user.

The earth pin of the standard three-pin plug, due to its forward position, is peculiarly liable to damage when the plug is dropped. The writer has had examples of plugs being in use with the earth pin snapped off, and left in situ in the switch-socket, the switch-socket continuing to receive the damaged plug, and no query arising until an attempt is made to use the portable tool from another socket.

Pin Design

It is appreciated that the brass comprising the plug pins is chosen for its rapid machining properties, rather than its resistance to impact. Even so, a much stronger pin would result, in some designs, if the terminal end entering the plug moulding were not so greatly reduced in diameter. The pin shoulder could also be given a greater radius, and the holes in the plug base moulded to suit. As an example, the earth pin of a well-known 15A plug changes in diameter from 0·341 in. to 0·151 in. at the terminal end, and the small diameter is threaded full length. On such a plug being dropped, it is not uncommon for the earth pin to develop a crack in the shoulder, and break away later.

Semi-flexible mounting of the pins by means of a plastic plug body embodying rubber inserts, would seem to be one solution to the problem of pin breakage.

Restrictions in the sizes of plugs from the motives of economy and convenience frequently lead to the incorporation of cable grips resembling rat traps in their effect. The cable is gripped to such a degree, that after being in use for a short period, it bends away from the plug at right angles. Failure of the cable at the plug end is then only a matter of time. It should be a rule that a flexible cable attached to a plug should not only be properly anchored, but supported in such a way that no abrupt change from solid to flexible occurs. A tapering rubber sleeve, two to three inches in length, which is drawn over the cable before connecting, and gripped in the plug body, thus securing the cable as well as supporting it, meets both requirements.

HYDROGEN COOLING

Some Theoretical Considerations of its Advantages for Large Machines

By JOHN H. JUPE, A.M.I.E.E.

THE use of hydrogen on this side of the Atlantic for the cooling of large rotating electrical machines is a matter which has received considerable attention since the war and would certainly have developed sooner if hostilities had not prevented it.

The earliest reference to this method of cooling is probably in American Patent No. 1,453,083, which was filed in 1916, but little else was done until the 'twenties, when the subject was investigated carefully by the General Electric Co. of America. Towards the end of the decade a machine was built in the United States and it proved to be so successful that by the early 'thirties a number of units were in service.

The earliest machines were synchronous capacitors without mechanical loads, because the fact that such machines are "one-piece" in form eliminated the necessity for a gas-tight sealed bearing. This problem had, of course, to be faced when alternators were planned, and has now been solved with complete success, though the "one-piece" machine (synchronous capacitor, or rotary converter) must always be of simpler construction.

To show why hydrogen is so advantageous for cooling purposes it is desirable to consider, in general, the elements of machine cooling, and turbo-alternators provide a difficult case.

The output of an alternator can be expressed in the form

$$kVA = kd^2ln.$$

where l and d are the rotor length and diameter respectively, n is the speed and k is an arbitrary constant.

Usually n is fairly high and therefore to keep stresses within reasonable bounds d must be small, which in turn makes l large, for a given output. This obviously brings difficulties of cooling, especially in the middle of the rotor. To appreciate these difficulties it is useful to consider briefly the amount of heat involved and the problem of its transfer outside the machine.

The weight of 1 cu. ft of dry air at 65° F. and 28·5 in. of mercury is 0·07272 lb. and its specific heat 0·2418.

Since 1 B.Th.U. = 778 ft lb., the energy required to raise 100 cu. ft of air through 1° C is

$$0{\cdot}07272 \times 100 \times 0{\cdot}2418 \times 778 \times 9/5$$
$$= 2462 \text{ ft lb.}$$
$$= \frac{2462 \times 0{\cdot}746}{33{,}000} \text{ kW/min.}$$
$$= 0{\cdot}0559 \text{ kW/min.}$$

Consequently 1 kW loss will raise the temperature of 100 cu. ft through 1/0·0559 = 18° C. in 1 min. Therefore it is clear that a large machine with, say, an output of 80,000 kW and 96% efficiency (3,200 kW losses) would quickly become dangerously hot if a substantial amount of cooling was not introduced.

Windage and Noise

The losses in the machine will be composed of the usual mixture of electrical and mechanical losses of which wind resistance will form a substantial part of the latter group, therefore any method of reducing windage is desirable and the low density of hydrogen makes it an obvious choice. A low gas density also means that sound is not conducted so well and therefore hydrogen-cooled machines tend to be quieter in operation than those which are air-cooled. A vacuum would perhaps seem even more attractive but it must be remembered that although the rotor losses are not large (about 10% of the total), a gas is the only satisfactory medium for conducting them away from the machine. Therefore a gas with a high specific heat is indicated, and hydrogen again becomes desirable, with a figure about 14 times better than that of air. Hydrogen also has a higher thermal conductivity than air (about six times better) and can therefore absorb heat faster from the machine and when compared with an equal flow of air will produce cooler windings and lower copper losses. Its use will also mean that insulation will be cooler and will have a correspondingly longer life and the machine will have an increased short-time

rating. Furthermore, by increasing the pressure of the hydrogen the short-time rating can be increased beyond that for a corresponding increase of air flow.

Hydrogen will also surrender its heat faster and a built-in or external gas cooler will be smaller than if air was used as the cooling medium. The sum total of all these advantages is that the use of hydrogen will increase the efficiency of the machine by 0·5-1%.

Elimination of Oxygen

A further point, and a most important one from the maintenance aspect is the advantage gained by the elimination of oxygen from the interior of the machine. Not only is the oxidation (and life) of the materials used in the construction eliminated, but also there is no deterioration of the lubricating oil, because hydrogen has no adverse effect on oils and the inhibitors used in them.

Another aspect of this matter of oxygen is that if by chance flashover or corona should occur, the probable damage to insulation will be much smaller than if the event happened in an atmosphere containing oxygen. It is sometimes suggested that helium could be used as an alternative to hydrogen. This is quite a reasonable proposal because its density and thermal properties make it more suitable than air (though not so suitable as hydrogen) and it is, of course, non-inflammable and inert chemically. Cost, however, completely rules it out so far as this country is concerned, as it is about 18,000 times more expensive than hydrogen.

Explosion Risks

Mention above of flashover naturally brings up the matter of explosion, and since this is one which has often been raised by critics it is as well to consider it in a little detail.

Firstly the limits of inflammability of hydrogen-air mixtures. This varies according to the method of determination, but by using the almost universally accepted method it will be found that all hydrogen-air mixtures between 4·2% and 74·6% of hydrogen (by volume) are inflammable. The mixtures at the extremes are only mildly explosive, but there is increasing violence of explosion as the mid-point is approached, with a maximum at about 33% of hydrogen.

However, during the operation of a hydrogen-cooled machine it is not at all difficult to maintain the composition of the internal atmosphere at 95-98% hydrogen and therefore the possibility of a highly dangerous mixture existing is very small.

It is interesting to note in connection with the supposed danger, that another explosion hazard already exists in many turbo plants and yet never causes undue worry. This other hazard is the explosive properties of the oil mist and air which often exists in the lubrication system. This condition has been known definitely to be the cause of an explosion, which may occur irrespective of the flash point of the oil used.

Regarding the destructive force of an explosion within an alternator casing, it should be remembered that the maximum pressure from an explosion will be developed when the container is spherical and the mixture is ignited at the centre. By the use of the most explosive hydrogen-air mixture, at 760 mm. pressure and at a temperature of 15° C. the maximum pressure will be 105 lb./sq. in. gauge pressure. Within the alternator casing (obviously far from spherical) there will be a number of heat-absorbing surfaces, which will extract energy from the explosion almost from the moment of ignition and therefore the maximum pressure developed in a practical case will be well below 105 lb./sq. in. One figure quoted gives 50-75 lb. as the probable order of pressure.

It is a simple matter to design an alternator casing which will easily withstand the highest pressure likely to occur. Therefore, when it is examined in the proper perspective, the question of an explosion within the machine is of small significance because (*a*) it is extremely unlikely to arise, and (*b*) with reasonable precautions, its chance occurrence would be unlikely to cause substantial damage to the machine.

REFERENCES

"Fundamentals of Heating Calculations of Electric Machines." R. Pohl. *Archir fur Electro-Technik.*, Vol. 12, 1923, p. 361.

"Hydrogen as a Cooling Medium for Electric Machines" Knowlton, Rice and Freiburghouse, *Trans. A.I.E.E.*, Vol. 44, 1925, p. 922.

"Liquid Film Seal for Hydrogen-Cooled Machines." Rice. *G. E. Review*, Nov. 1927, p. 516.

"Hydrogen Cooling of Large Machines." Fechheimer. *Elec. Journal*, March 1929, p. 127.

"Outdoor Hydrogen-Ventilated Synchronous Condensers." Wieseman. *Trans. A.I.E.E.*, Vol. 48, 1929, p. 1221.

"Windage Losses in Air, Hydrogen and Carbon Dioxide." Rice. *G. E. Review*, May 1925.

"Free and Forced Convection of Heat in Gases and Liquids." Rice. *Trans. A.I.E.E.*, Vol. XLII, 1923, p. 653.

"Free Convection of Heat in Gases and Liquids." Rice *Jour. A.I.E.E.*, 1924, p. 1141.

"Forced Convection of Heat in Gases and Liquids." Rice. *Jour. Industrial and Engineering Chemistry* Vol. 16. No. 5., 1924, p. 460.

"Application of Hydrogen Cooling to Turbine Generators." Ross. *Trans. A.I.E.E.*, Vol. 50, 1931, p. 381.

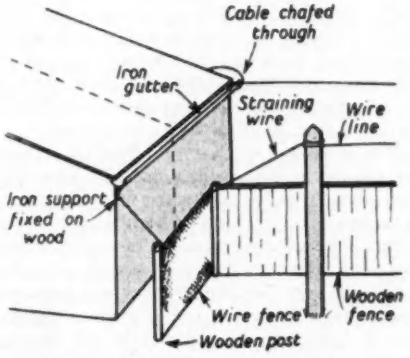
Problems and Practice
IN ENGINEERING

Washing Day Shocks

RECENTLY I received a panic call from an irate consumer who insisted that she was receiving shocks from her clothes line in the garden. This promised to be rather interesting, so I decided to investigate, and to my astonishment was able to get a full light from a neon lamp by making contact with the clothes line, which happened to be of the galvanised wire type.

After making all the usual tests and inspecting the installation, I came to the conclusion that there was no possible electrical connection between the house and the line. I then reloaded the consumer's fuses with 2-amp wire and proceeded to earth the clothes line to the water tap with a length of 7/044 v.i.r. cable. The result produced the usual shower of sparks and the clothes line again resumed its normal potential and produced no shocks, but to my amazement the fuses were still intact.

I was debating the next move when an excited consumer from the next house, No. 4, informed me that her radio and lights were off.



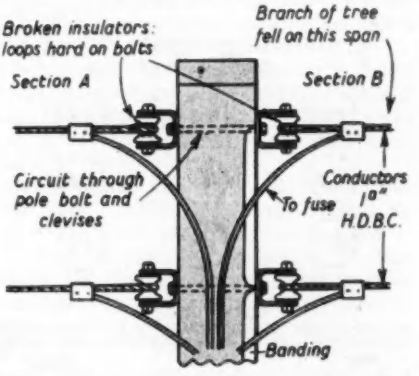
Position of fittings earthing the supply line

I visited No. 4 and discovered the lighting fuses which were 15-amp had blown. Further investigation showed a length of twin 3/029 t.r.s. cable looped from the kitchen light and disappearing through the window on its way to a shed in the garden. On the way to the shed, however, the cable had been wound round an iron gutter to secure it. This gutter was also in contact with the next door house, No. 2. The cable, through constant movement in the breeze, had been worn through, so that the live wire was in contact with the gutter.

By means of various stay wires the clothes line of No. 2 was in contact with the offending gutter. This peculiar fault had also given more than its share of radio interference in the neighbourhood. By disconnecting the offending length of t.r.s. all danger was removed.—*F. Broadway.*

Indirect Supply

ONE windy day during the last winter the chance observation of a passing mains engineer led to the discovery of a freak happening on our overhead line system. A dangerous



Details of pole-top fittings when fault existed

condition was created which, obviously, might have resulted in a serious accident. Reference to the accompanying sketch shows pole "P," being the junction of sections A and B of the overhead mains, each section being supplied by its own transformer; l.t. fuses were mounted on pole "P," but these fuses were normally left "out." On the day referred to, a branch of a tree was torn off by the heavy winds, falling on to span of overhead conductors on Section B, adjacent to pole "P"; the impact of the falling branch did not break conductors but caused a temporary "short" between the

two topmost conductors, red and white phases, and in consequence the red phase fuse, controlling this section blew, simultaneously the conductor "snatch" was sufficient to shatter the two red phase bobbin insulators at pole "P," thereby bringing the make-off loop of conductors into permanent contact with the through-bolt of bobbin insulator. Thus a circuit was established through the steelwork; consumers on red phase on B section were actually supplied from A section. This condition had apparently obtained for some hours, and no report of anything untoward had been received by the department. The incident was discovered by an engineer, who, passing in his car, noticed some pieces of broken porcelain on the footpath at foot of pole "P," and very wisely stopped to investigate.—*E. J.*

Machine Cables

THE following data relate to a 30 MW 6·6 kV 50 cycle 3,000 r.p.m. machine and indicate the conditions which can obtain in cables associated with large turbo-alternators.

Fig. 1 shows the cable arrangement. The load on the machine at the time of the tests was approximately 1,800 amp at 0·85 power

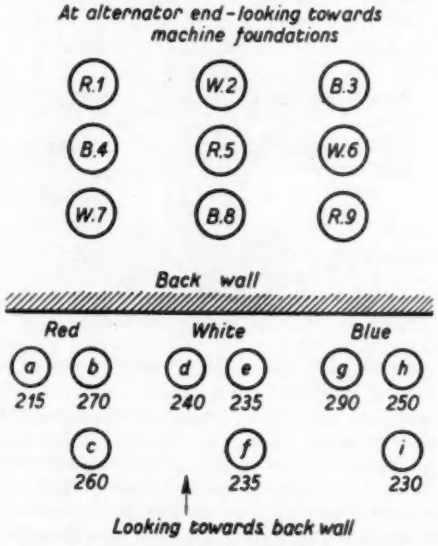


Fig. 1 (above) and fig. 2 (below) show cable arrangements and current magnitudes

factor. The full load current of the machine is given by

$$I = \frac{30{,}000 \times 1{,}000}{\sqrt{3} \times 6{,}600 \times 0{\cdot}85} = 3{,}100 \text{ amp.}$$

Referring to Fig. 1:—

Voltage between sheaths			*Voltage between each sheath and earth*		
Sheaths Nos.		*Volts*	*To Earth*		*Volts*
1 — 2	—	15	1	—	9
2 — 3	—	13	2	—	7·5
1 — 3	—	15	3	—	8
3 — 4	—	0	4	—	8
4 — 5	—	15	5	—	8
5 — 6	—	13·5	6	—	8
4 — 6	—	14·5	7	—	8·5
4 — 7	—	14	8	—	9·5
7 — 8	—	14	9	—	8·5
7 — 9	—	15			
8 — 9	—	14			
6 — 7	—	0			
1 — 6	—	14·5			
4 — 9	—	14·5			

At the circuit breaker end—approximate load of 1,450 amp at 0·93 power factor—the currents in sheaths and cables at ends joining the switchgear are shown in Fig. 2. The tests were made with a tong-type tester, but the tongs were open some 5/16 in. to prevent overloading of the instrument, which read up to 400 amp.

The voltage to earth was zero—all cable sheaths being earthed at the switchgear end.—*C. B. Y*

Continuity Testing

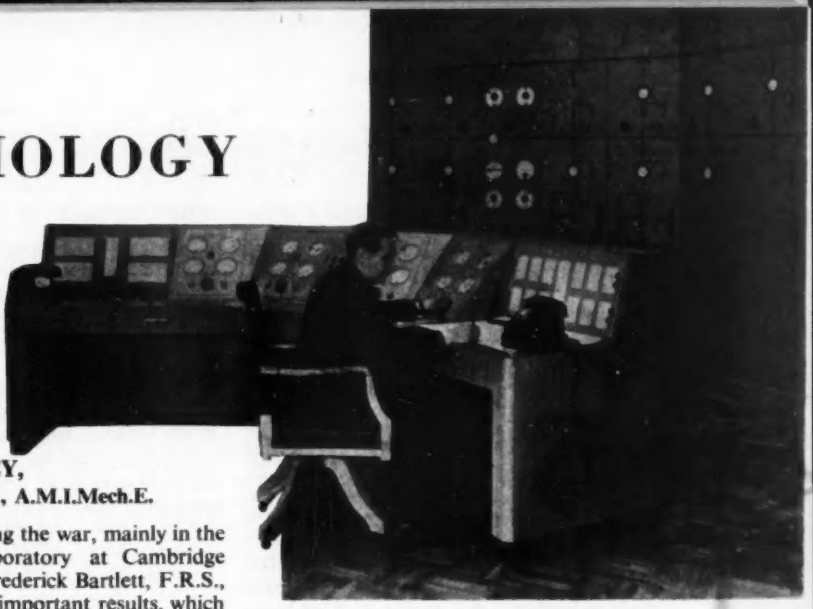
I HAVE several times had to mend electrical apparatus in the house with very little by way of instruments. Continuity tests for earth leads and such like are easy, of course; you use a torch with the earth lead as part of the circuit and if the earth lead is continuous the torch lights. Testing an iron or kettle element for continuity, however, is not so easy as the current passed is not sufficient to light the bulb and I have found that the easiest method of testing these circuits is with a wireless !

The aerial and earth terminals of the wireless are shorted together with a loop of wire and the wireless switched on and given time to warm up. A battery is connected to a second loop of wire which is placed concentric to, but not touching, the first. The two free ends are now touched across the iron element, or other high resistance apparatus to be tested, and, if the iron element, etc., is continuous a loud crackle will be heard in the wireless. Care should be taken when testing kettle elements not to use the element itself as the second loop, as the element is effectively screened by its metal casing.—*J.L.P.V., Uganda.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

2 AUGUST, 1951

PSYCHOLOGY and the Control Room



By W. H. DUNKLEY,
B.Sc. (Eng.), M.I.E.E., A.M.I.Mech.E.

WORK done during the war, mainly in the Psychology Laboratory at Cambridge under Professor Sir Frederick Bartlett, F.R.S., has shown some very important results, which are capable of being profitably applied in the design of power station control arrays. Still more, the lines of study and thought, with the vocabulary developed by and for the work, enable engineers who have been intimately and long engaged on the practical design of instrumentation and control arrays, to take a new look at their subject, in the new light that has been thrown on it by study of the relation between men and machines in all its aspects.

It is not easy for an engineer without special psychological knowledge to arrange the ideas and the results of the Cambridge work, in order of importance to the designer of control arrays. The following observations, however, are intended to outline the part of the field that the researches have covered, which seems to be of special concern to the construction of power plant. Questions are interjected, not all of which have been answered.

One stimulus to the Cambridge work in the war was to improve the fighting qualities of fighting machines. A machine might be perfect in every normal engineering sense, but be a death trap if not instantly and accurately controllable. The problems posed by that statement differ in urgency but not in essence from those which arise in control of a power station or transmission network.

Operational Analysis

A first illuminating thought is that control arrays may be viewed as composed of two classes of components. These are (a) those parts through which men give instructions to machines. This is called "control" in the vocabulary of the study, and (b) those parts through which machines give information to men as to what the machines have done, are doing, or will do. All these components form the "display."

On power station panels generally "control" elements are associated together as a class in horizontal bands and with their corresponding display elements in vertical bands. But this is not a rigid rule. Ought it to be so?

Having split the subject into control and display, the effect on men of different or altered arrays and components can be studied in many aspects, limiting in each study the number of variables.

Attention has been given to the shape, colour, size, position, and spatial relationship between the components of complete arrays.

These components include instrument dials, pointers, lettering, graduation, height, angular set and number. They include on the "control" side every feature of handwheels, pedals, levers, push buttons. What should be the diameter rate of rotation and optimum torque of a control handwheel for a given purpose? Should symmetry be aimed at? If so, why? What should be the note and loudness of an alarm signal to obtain the quickest correct response from the operator without frightening him, or making him weary of the noise?

Assuming that an operator has to conduct a series of operations, how should the controls be arranged in sequence—spatially so as to come naturally to hand and contribute thereby to correct, fast, and confident action? In this connection the term "meter attunement" is used. This provokes thought about the hand of a pianist sweeping up and down the keyboard apparently smoothly, but responsive to a basic rhythm. The mind resents the idea of a short,

sharp, straight movement, in sequence with a long curved one, leading quickly to errors of over- or under-shooting the mark.

Attention has been given to the accentuation in an array of the most important elements. For example, we might consider a row of draft gauges, perhaps six for each side of a boiler, high up on a panel. The boiler operator cannot read them easily and probably disregards them until some other sign of fouling turns his eye to them. To make such gauges signify, one might single out an overall draft across the boiler and set it on an instrument with a pointer having a massive broad arrow vertical when the unit is on full load and "average clean." This would give the normal operator all he normally needs. The question then arises whether in fact the presence of all the draft gauges on that panel is desirable. Would the operator find his job less worrying if he knew nothing about minor changes of no significance to the day to day efficiency of his performance?

Picture Conception

The above thoughts lead to the picture conception of a display array.

The normal operator does not read instruments all the time. He views a picture. He knows quite unconsciously when the picture has changed from normal. Then he spots the instrument that has changed, and thinks what it requires him to do. Is an arrangement that seems logical to a design engineer bound to be right for an operator who has not had that kind of training? Should not the operator be asked?

How should the normal picture be planned to make changes most readily "spottable"? Should all the pointers stand at 12 o'clock when the unit is on M.C.R.? Should the pointers be broad arrows, or black onions? What colour should the pointers be? How fine the graduations of the scale? Is the operator on a unit panel concerned with the past history shown on the recording instruments he sees and is he, in fact, made a better operator by having a history book as well as current events before his eyes? Should any or all recorders be outside the operator's normal view? We have, in general, now removed protective devices from control panels: Why? Is not one answer "Because they over-awed the operator with a false sense of the complexity of his task"? That may be as important as saving multicores and space. We need to simplify the task down to its fundamentals, and then ensure that the operator truly grasps them and is not anxious about what does not really concern him. "The chief cause of feebleness is anxiety"—at any level in human activities. A great source of strength is confidence and just the required knowledge.

The Question of Interest

Bartlett has demonstrated that the relaxing of effort in repetitive work can be due as much to decline of interest as to fatigue. The Hawthorn experiments showed the same in another way. How should control and display be altered in this light?

Should we reduce the number of elements of display and make them more interesting as to shape, colour, size and disposition? Should the room be palatial? How bright should be the light and what colour the walls? Do we tend to produce a kind of Nirvana atmosphere in our control rooms, so that it requires a constant effort of will to retain the idea that anything really matters? This is a dangerous thing for young men, who are so prone to a kind of mental torpidity if their job has no physical effort and little variety in it.

It is possible to find modern control rooms from which nothing can be seen of the outside world, not even diurnal changes. Is this a premeditated condition, and, if so, is it the result based on one opinion, on a symposium of opinions on a Gallup poll of operators, or is it based on scientific research in a psychological laboratory? Does it matter to a single individual who will have the responsibility of controlling a 100 MW boiler turbine unit, whether he sees (a) the unit, (b) other people, (c) the outside world, as well as his display control array, for hours on end?

What is the use of mimic diagrams? Are they a good substitute for ability to see the unit and the outside world? Do they give the operator the greatest possible sense of power over his machine environment without getting tatchy, domineering, or unduly meek in his telephonic or other relationships with outside men? Can he feel like the conductor of an orchestra? Can mimics be improved? Do they need to contain finely graduated instrument dials, or would lights as on the cheap car dash be better, to show that things are normal?

Response to Stimulus

Bartlett has analysed in great detail the chain of events when a display evinces a change which requires a man to notice it, examine it, interpret it, decide on the correct action, select the control element through which the action must take effect, make the control movement, prepare his mind to receive the corresponding change or correction in the display which will finally check that he has done right, and finally

return to the "ready" for the next stimulus. Every one of these details can be influenced as to speed and accuracy by change of material or mental elements in the total man/machine relationship and, of course, specially by the rational and scientific design of control and display arrays.

How is the repeated execution of such sequences affected by all other environmental factors not elsewhere mentioned above? For example, temperature, humidity, air changes, background noise, lighting, structural vibration. How many different alarm noises can be allowed in a control room?

It appears that in the Cambridge work good answers can be found to very many of the questions here raised. They certainly have the ability to find a good answer to any clear question, or to assist in finding it.

The object of these observations and questions is not to suggest that we are ignorant of the principles of design of control and display arrays, but to suggest that we have to view the subject as part of the psychology of man/machine relationships, as Bartlett and his colleagues viewed the instrumentation of ships, guns, tanks, aircraft, fighter controls and radar.

The basic ideas put forward by the Cambridge experimenters are both intelligible and stimulating. If these gentlemen can be led to take an interest in running and planned instrumentation, it seems likely that many of the things they have discovered would strike them as directly applicable to our technique, in the interest of better man/machine relationship.

The object is, of course, to get better and/or cheaper layouts, which the average operator will understand and treat better, handle with more precision, less anxiety, less boredom, less bad temper, to give the same, or better, results.

RULES FOR SHORT-CIRCUIT TESTING

A.S.T.A., or the Association of Short-Circuit Testing Authorities, requires little introduction to the electrical industry. Formed for co-ordinating the testing and certification of British switchgear, and to establish common standards of performance and testing, its constitution and objects were originally described in the ELECTRICAL TIMES for June 1, 1939.

One of the chief necessities has been to establish a common basis for testing and thus secure uniformity of results obtained at the various stations and on different classes of gear, and the results obtained and experience gained over the last twelve years have been published for the guidance of its members.

A.S.T.A. Publication No. 1, giving a general description of the aims and facilities of the Association, has been generally available for a number of years, and has been previously noted in these pages. It is now felt that increasing interest in switchgear testing warrants further information being made generally available and a number of booklets have been published, as follows:—

No. 5.—"Interpretation of Standard Rules governing the short-circuit testing and certification of oil circuit-breakers" (20 pp.).

No. 6.—"Interpretation of Standard Rules governing the short-circuit testing and certification of low and medium voltage fuses for a.c. circuits" (12 pp.).

No. 7.—"Rules governing the short-circuit testing of circuit-breakers which are not included, or have features not provided for in BS.116 : 1937 and BS.936 : 1940" (12 pp.).

No. 8.—"Rules governing the short-circuit testing of high-voltage fuses for a.c. circuits" (28 pp.).

No. 9.—"Rules for the short-circuit testing of circuit-breakers in combination with back-up fuses" (16 pp.).

No. 12.—"Rules for the short-circuit testing of power transformers, current-transformers, reactors and resistors" (12 pp.).

These documents fall into two categories: (i) Interpretations of existing British Standards in relation to the short-circuit testing of apparatus to ensure uniformity of test procedure and judgment of performance between Test Stations. (ii) Rules for the short-circuit testing of apparatus not yet covered by a British Standard to ensure uniformity of testing.

All publications are of uniform size ($9\frac{1}{2} \times 7\frac{1}{4}$) and in general each document covers: Information required by the Testing Authority for the purpose of identifying the apparatus to be tested; the information and results to be recorded by the Testing Authority; permitted deviations from the strict requirements of the appropriate specification(s) such as may be necessitated by the test plant limitations; and assessment of performance as judged by the behaviour of the apparatus during test and its condition after test. The "Rules" publications also include fundamental terms, method of rating and criteria of severity.

In publishing the "Interpretations" the Association wishes to emphasise that in no way do these modify or conflict with any British Standard but amplify such points as cannot, of necessity, be covered by a general standard specification.

The "Rules" publications for apparatus not covered by British Standards are not intended to be final and will be subject to revision on the issue of such Standard.

Copies of these publications are available on application to the Secretary, The Association of Short-Circuit Testing Authorities (ASTA), 36 Kingsway, W.C.2, price 5s. each, post free.

Plant Installation in S.A.

Escom's 1950 Report Indicates Progress to Date

AT present in difficulties in regard to supplies of coal for some of its power stations, the Electricity Supply Commission of South Africa already has troubles arising out of the general plant shortage, although good progress has been made in the work of erecting new power stations, etc. It is expected that the restrictions on load increase which were extended within the area of the Rand undertaking, earlier this year, to apply not only to gold mining, but all industries, will have to remain in operation for two to three years. By that time, there should be a substantial improvement in the plant position, for the Commission has an extensive development scheme on hand, as we have earlier recorded.

Progress in this work is indicated in the 28th annual report of the Commission for 1950, just to hand, but first, we should note that units sold by the Commission increased by 11·064% to 6,910·5 millions, of which the Rand undertaking alone accounted for 5,151·7 million, over 70% of which was used for mining. The average price per unit sold was 0·3289d. to the 497,610 consumers connected. Domestic consumers number 417,437, their average consumption last year being some 3,288 units.

Plant Capacity

At the end of December, the aggregate installed capacity at the Commission's power stations was 1,513,975 kW, an increase of only 28,000 kW over the corresponding figure for the previous year. But plant under erection or on order will bring the total to 2,487,705 kW. For instance, at the year's end a 40 MW set and a 33 MW unit were under erection at the Congella and Vaal power stations, respectively. In addition to the above, two 580 klb/hr boilers and two 60 MW turbo-alternators have since been ordered for Taaibos, and an offer by a British manufacturer of a 30 MW set for delivery next year was gladly accepted. This latter set is to be installed at Rosherville power station, two suitable boilers being on order from America.

On progress in plant erection, the report indicates that the first new power station will be Hex River, at Worcester, where the initial 20 MW set should be in operation later this year. In all, this station will have five 20 MW sets and seven 200 klb/hr boilers. The next new station will probably be Vierfontein, where steel work is arriving, and the first of seven 30 MW turbo-alternators should be running early in 1953.

At Vaal generating station, the last of four 190 klb/hr boilers was installed, and No. 6 30 MW turbo-generator has since been commissioned, but this set will not be available for full service until two more boilers are completed next April.

Cost Per kW

Other new stations under construction are Swartkops (60 MW+), Taaibos (360 MW), Salt River No. 2 (180 MW), Umgeni (180 MW) and West Bank No. 2 (90 MW). Messrs. Merz and McLellan are responsible for the design of the three latter named stations, and the Commission's staff for the remainder. At Taaibos the stators for the turbo-generators will each weigh 110 long tons —the largest yet ordered for any power station in South Africa, it is claimed.

Comment is again made on the steadily increasing cost of constructing and equipping generating stations in the Union; the 424 MW installed at Klip up to 1940 cost only £15·4 per kW, and the 150 MW then planned for Vierfontein by 1955 was estimated at £55 per kW. The position is reflected in a worse light in the new stations such as Hex River, Swartkops, Umgeni and Salt River No. 2, where the initial installation is only a small proportion of the planned ultimate capacity of the stations. In the case of the last named station, the figure is as high as £80 per kW for the initial installation, but £56 per kW for the ultimate capacity estimated on prices paid for plant for the initial stage.

On the transmission side, the 114 miles of 132 kV line from Colenso to Umgeni is under construction, as is a similar line from Umgeni to Springfield. In 1950, a further 113 miles of 88 kV line were completed, and work is in progress on another 204 miles of such line. Among the projected schemes is 80 miles of 132 kV line connecting Vaal to Vierfontein, and 60 miles (double circuit) of 132 kV line from Vierfontein to Alma.

Operation

Increasing costs made it necessary to raise tariffs during the year under review, and although revenue rose by over 14% to £9,526,071, production costs jumped by nearly 15% to £9,579,968, thus the year's operations resulted in a deficit of £53,897.

Of the generating stations, Vaal had the highest thermal efficiency (23·81%) with Congella No. 1 and 2 close behind with 22·21%, followed by Klip with 21·22%. Vaal consumed 1,008,315 tons of coal, the corresponding figures for Congella and Klip being 366,413 and 2,450,793, respectively. But it is in regard to the average cost of fuel per ton that a difference is noticeable. The cost at Vaal, for instance, was 5s. 4d. per ton last year, and at Klip 5s. But at Salt River the price was 32s. 5d. a ton.

The Commission's only hydro-electric station, Sabie, was affected by a drought, the output during the year being reduced to 6·3 million units. This station only supplies two gold mines, which have amalgamated, and it was necessary at times for recourse to be made to the mines' diesel set.

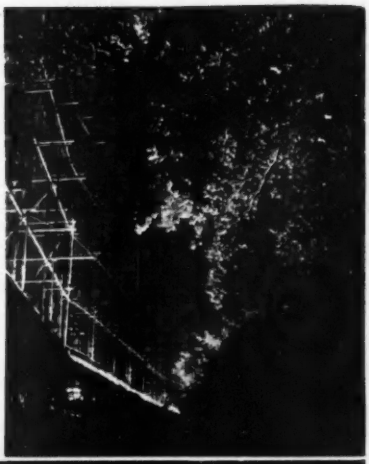
Lighting for Fun at Battersea

G.E.C. make large contribution to colourful lighting at the Festival Pleasure Gardens

(Right) About 100 "Osram" white opal single-ended tubular lamps are used in the candelabra fitting under the cupola at the entrance to the main vista. The smaller fittings have 15W white sprayed twisted candle lamps

(Below) Signal green colour screens on some 60 G.E.C. floodlights provide an effective background of illuminated foliage for the "Crystal Palace" facsimile. Seen here from the rear to show the location of the lights

(Below, right) Another view showing the two towers each illuminated by four floodlights (Bottom, left) Tree lighting through green and amber screens specially designed for attachment to floodlights with domed front glasses (Bottom, right) lighting the Nestles Playland building



overseas news

Pyrmont Delay

Sydney County Council has spent £300,000 in higher wages and extra payments to contractors to speed up construction of the new Pyrmont power-house, but without effect, the chairman of the council, Mr. W. P. Henson, stated recently.

Councillor Henson said that idling on the job and strikes had put the power-house about six months behind schedule since the council started a speed-up programme last August. The power-house, would not now be in operation before the end of the year.

Kiewa Project

The State Electricity Commission of Victoria is to let a contract valued at £A790,000 to two French companies jointly, the Société des Etudes et des Entreprises and the Société Nationale des Travaux, to drive the longest tunnel yet undertaken in the Kiewa hydro-electric project. The tunnel will supply water for a 64,000 kW power station nearly 4,000 ft above sea level which will be built on the mountainside instead of underground as planned originally.

Progress at Trevallyn

Work on the construction of the dam at the Second Basin on the South Esk River in Tasmania for the Trevallyn Hydro-Electric project is now under way. The dam, 75 ft high, 80 ft thick and 600 ft wide, requires 80,000 yards of concrete in its construction. Water from the dam will be taken through a rock tunnel to the power station to be erected alongside West Tamar Road near Riverside.

Power Restriction Case

In Melbourne recently, doubt was thrown on the validity of the recent power restrictions imposed by the State Electricity Commission of Victoria. But in a law action the court ruled that a Commission advertisement setting out restrictions was "so ambiguous as to be unintelligible to the general public." The court upheld an earlier decision dismissing a charge against a consumer who, it was alleged, failed to turn off his water heater during the prohibited consumer hours. It held that the Commission had failed in the prosecution because it had not proved the consumer's guilt. After careful scrutiny of one item in the regulations, the court itself was not certain what the regulation meant, it said. "That emphasises the need for the Commission to express, in unambiguous language, what course of conduct it requires the consumer to pursue," the court said. "It surely must be possible for the Commission to tell the ordinary householder in simple terms for what purposes, with what hot-water services, and within what hours he may use electricity," stated the judgment.

The Commission has a number of other prosecutions pending, and further action now depends on whether the person concerned has been genuinely trying to assist in the conservation of power, we understand.

Protection

The Indian Tariff Board's recommendations for the protection of the electric lampholder industry have been accepted by the Indian Government and the existing duties are to be converted into protective duties. The Board's recommendations were that a protective duty of 45% should be imposed on brass lampholders of British manufacture, and that the standard rate of duty should be adjusted in accordance with the terms of the U.K.-Indian trade agreement of 1939. The protective duties will remain in force until December, 1953.

Sweden's Extensions

The Swedish Waterfalls Board has announced that it is to ask for a State allocation to build two new power stations on the Indal River next year and to install a third generating unit at the Midskogs hydro-electric station. The combined output of the three new units will be 150,000 kW.

Manitoba's Position

The proposed referendum as to the future of the Winnipeg City Hydro electricity undertaking is not to be put to the city electorate this winter, it was decided at a meeting of the city power committee last month. The committee also learned from Mr. J. W. Sanger, general manager of City Hydro and a member of the Province's Hydro Electric Board, that expropriation of the Winnipeg Electric Co., or purchase of its assets by agreement, may be postponed in view of the money market position. It is expected that a decision will be reached shortly whether to boost Manitoba's power production by development of McArthur Falls, on the Winnipeg River, or by erection of a steam plant so that equipment for either project could be sought this winter.

Quebec Link-up

In Quebec a link-up of the provinces, various electric power systems to permit one power producer to switch supplies into another system to overcome any local failure, is under study by the Government. Regularity and continuity of power supplies to different parts of the province is the purpose of the proposed grid system. Another power problem before the provincial government

is the choice between Carillon Rapids and Beauharnois, on the St. Lawrence River, as the site of future hydro-electric development.

Kariba or Kafue?

The results of expert investigations, carried out since the drawing up of the report of the Inter-territorial Commission that investigated the potentialities of the Kariba Gorge and Kafue River hydro-electric schemes, suggest to local observers that the possibilities of the Kafue scheme have not received full justice in the report (noted in our July 12, issue). While expert opinion in Government and industrial quarters makes no criticism of the commission's proposals for developing the Kariba scheme—it is suggested that, if later information about the Kafue scheme (and in particular the report of Brig. C. G. Hawes, who made a hydrological investigation of the Kafue earlier in the year) had been available to the commission, its recommendations might have been substantially different. The commission's report put the maximum potential of the Kariba Gorge scheme at 1,000 MW, and of the Kafue project at 380 MW, although Brig. Dawes says that an output of more than 450 MW could be achieved at the latter site by the building of a second dam across the river above the gorge. Kafue could also be developed in stages, 160 MW initially, it is suggested, then to 250 MW and finally 450 MW. Apparently, the general opinion locally is that the Copperbelt's power needs could be met from Kafue for some time to come.

Coal for Klip

A new railway line, from the new Springfield Colliery, Grootvlei, intended primarily to supply the Klip power station of the Electricity Supply Commission of South Africa, was formerly inaugurated last month. The line, which is 45 miles long, has cost nearly £2,000,000—the most expensive branch line yet built in South Africa. It will carry 2 million tons of coal a year initially, rising to 5 millions in the near future. It became necessary as dwindling supplies in the Vereeniying area forced Escom to look farther afield for coal. At Grootvlei, it is estimated that there is an extractable reserve of over 200 million tons.

Bridge Railway?

The provision of an electric railway on the proposed Auckland harbour bridge was urged by Mr. D. J. Eyre in the New Zealand House of Representatives last month. He asked the Minister of Works, Mr. Goosman, to consider incorporating an electric railway over the bridge. If that was not possible he asked, that the Harbour Bridge Act be amended so that technicians could make test borings while the bridge was being built to see if a harbour tunnel was feasible. Mr. Eyre stressed that the Halcrow-Thomas report had stated that an electric train service to the North Shore would be essential within 20 years. The arguments resolved as to whether provision should be made for the railway now or later.

Allegation Refuted

The New Zealand Manufacturers' Federation in an official statement has refuted the allegation that New Zealand lagged far behind other countries in the supply of modern designed electrical appliances in everyday use, particularly cookers, made by Mr. M. S. Chambers, chairman of the Hawke's Bay Electric Power Board, to which we referred on July 12. The Federation point out that it is unfair to compare, say, a de luxe model with the simplest cooker made in New Zealand. Certain models made in North America, but not in England or New Zealand, if imported, would cost between £150 and £250. Local manufacturers had never been opposed to the admission of American de luxe types of ranges—unprocurable from England. Such importation had been a matter of dollar availability, and the very high prices at which such ranges would have to be sold in that country. On the question of New Zealand-made electrical appliances in general, the federation reminded Mr. Chambers that "not very long ago electric supply authorities in New Zealand drew the attention of the English Board of Trade to the poor quality of many electrical appliances being supplied by English manufacturers to New Zealand. In addition, the rigid import control policy and an iniquitous price control policy as applied to manufacturers had been a very heavy drag on forward development by local manufacturers, it was stated.

Rationing

Putting into operation New Zealand's power rationing scheme, the Whangarei Borough Councils electricity load control committee recently dealt with the case of a consumer who had exceeded his allocation by 2,250 units, his allocation had been 950 units. It was stated that a water heater had been in use for 22 hours a day instead of a maximum of 15 hours. The consumer has been called upon to save 20 units each two monthly reading until the 2250 surplus is wiped out, or otherwise his supply will be cut off.

Waikato Contracts

As foreshadowed last week, the New Zealand Government has awarded a contract for the design and supervision of construction of two hydro-electric power stations on the Waikato River to Sir Alexander Gibb and Partners. Associated with them in the mechanical and electrical side of work as consulting engineers will be Merz and McLellan.

St. Lawrence Plan

The Public Works Committee of the U.S. House of Representatives last Thursday passed, by 15 votes to 12, a motion to pigeon-hole legislation authorising the St. Lawrence River seaway and power project. This action has brought disappointment in Canada where it had been hoped that co-operative arrangements between the two countries would lead to the completion of the project on the basis of their 1941 agreement.

PERSONALITIES

IN THE INDUSTRY

Promoted to generation engineer (construction) to the South East Scotland Division of the B.E.A. is **Mr. A. H. Marsh,** A.M.I.E.E., who has been previously senior assistant engineer (construction) with that Division for two years. He succeeds **Mr. J. Hagen,** A.M.I.E.E., who has now retired. For the two years prior to joining the B.E.A. in 1949, Mr. Marsh was resident engineer for Messrs. Kennedy and Donkin on the Portobello power station reconstruction. Receiving technical education at Leeds College of Technology, he gained early training with Greenwood and Batley, Ltd., and the Leeds Electricity Dept. He was senior draughtsman and technical assistant in the Construction Department of the Leeds undertaking when, in 1943, he joined the staff of Kennedy and Donkin.

Mr. A. H. Marsh

District engineer at South Shields for the North Eastern Electricity Board, **Mr. G. H. Dale,** A.M.I.E.E., is shortly to retire. He joined the former South Shields Corporation Electricity Department in 1920, and after various promotions, became borough electrical engineer in 1939 in succession to Mr. N. T. Smith, holding that office till vesting day. For a time he acted as executive officer at South Shields for the Board, and subsequently became district engineer.

It is not everybody's good fortune to be the proud possessor of a veteran motor car (although some still have to regularly use old models!)—but **Mr. J. A. Crabtree,** works director of the well-known electrical accessory firm of that name at Walsall, and his brother, **Mr. D. A. Crabtree,** have recently joined the enthusiasts' ranks. They have bought and renovated a 1901 steam car. This model has a 10-h.p. engine which is liquid fired—it must be a thrilling spectacle in motion. But if the same care and attention is devoted to this steam car as go into all Crabtree products, we are sure it will be running well for many years to come.

Mr. J. F. Harrison, mechanical and electrical engineer, Eastern and North Eastern Region, Doncaster, of British Railways, has been appointed mechanical and electrical engineer to the London Midland Region, at Derby. British Railways also announce that **Mr. R. A. Smeddle,** who has been deputy mechanical and electrical engineer of the Southern Region, Brighton, since October, 1949, has been appointed mechanical and electrical engineer, Western Region, at Swindon.

Chairman of the Electricity Commission of New South Wales, **Mr. H. G. Conde,** is leaving Britain for America again next Monday.

Miss Kathleen E. Piatt has been awarded the seventh Travelling Exhibition by the Caroline Haslett Trust. She will leave in September for a two months' investigation of electrical housecraft in Switzerland. Miss Piatt is housecraft adviser in the Chester sub-area of the Merseyside and North Wales Electricity Board.

Sir Frederick Leith-Ross and **M. Jean Louis** have been elected directors of Babcock and Wilcox Ltd.

Sir Geoffrey Winterbotham, vice-president of the Mica Trade Association, and chairman of the management committee, was re-elected to the chairmanship of the management committee at the annual meeting. The nine existing members of the committee were also re-elected.

On reaching superannuation age, **Mr. J. A. Vice,** O.B.E., A.M.I.E.E., M.Inst.F., generation operation engineer in the chief engineer's department of the British Electricity Authority, retired recently. He is succeeded by **Mr. G. R. Peterson,** B.A., M.I.E.E., previously technical executive assistant to Sir John Hacking, the deputy chairman (operations). At a farewell ceremony, Mr. Vice was presented by Lord Citrine with a refrigerator—or rather a cheque for one—to which his many friends in the Authority's service had subscribed. The chief generation engineers of the fourteen divisions also presented him with a gold wrist watch. Mr. Vice gained early training with the Lancashire Dynamo and Motor Co., subsequently entering the supply industry, serving at Ilford and Manchester, before joining the County of London Electric Supply Co., as resident engineer at Barking power station in 1924. In 1934 he became generating engineer in charge of the

Mr. J. A. Vice

Mr. G. R. Peterson

Barking and Littlebrook stations and the stations of the County Co.'s associated concerns. He served as technical adviser to the company from 1945 until receiving the appointment he has now relinquished. His successor, Mr. Peterson, had a varied training experience before spending 15 months in the test department of the American General Electric. Returning to Britain he served with Met.-Vickers and then joined the C.E.B. as assistant in the operation department of the N.E. England area. Transferring to the C.E.B. head office in 1942, he was seconded in the following year to the Ministry of Economic Warfare in connection with electricity supply in Germany and the occupied countries. Completing that work in 1944, he rejoined the C.E.B. in London as chief assistant operation engineer, and in 1946 became operation engineer for the N.W. England and N. Wales area. With the establishment of the B.E.A. in 1948 he became overseas liaison engineer and personal assistant to the deputy chairman of operations, until his appointment a few months ago as technical executive assistant to Sir John Hacking.

Earlier this week **Sir John H. Woods,** G.C.B., M.V.O., who has been Permanent Secretary of the Board of Trade since 1945, relinquished that post to join the English Electric Co. group. But in what capacity it is not yet possible to state, we understand. Sir John, who is 56, has had a brilliant career covering over 30 years in the Civil Service, entering the Treasury as assistant principal in 1920. He has been secretary to the Trade Facilities Act Advisory Committee, principal private secretary to the Chancellor of the Exchequer, and a principal assistant secretary in the Treasury from 1940-43. From 1943 to 1945 he was permanent secretary to the Minister of Production. He was educated at Christ's Hospital and Balliol College, Oxford, served in France during the First World War in the 22nd Battalion of the Royal Fusiliers and was invalided out of the Army as a result of wounds.

Sir John H. Woods

The Micanite and Insulators Co., Ltd. has announced the following appointments: **Sir Arthur P. M. Fleming,** C.B.E., D.Eng., M.I.E.E., for the past 22 years director, is now deputy chairman; **Mr. H. A. Cooper,** F.C.I.S., for many years secretary and who has been for the past six years secretary and manager, is appointed general manager; and finally, **Mr. F. L. Hooton,** F.C.I.S., A.A.C.C.A., for the past two years acting secretary, to be secretary in succession to Mr. Cooper.

The name of **Mr. A. J. C. MacLeod,** whose appointment as export manager to Lancashire Dynamo and Crypto (Mfg.) Ltd., we noted last week, was incorrectly given as McLeod.

From Berry's Electric Ltd. we hear that **Mr. Eric Page,** who has been the company's East Midland area representative since 1946, has now been appointed manager of the firm's Birmingham branch. **Mr. F. Duckham** has taken over the Manchester branch.

Mr. E. Page.

Mr. Percy Tonks and **Mr. F. Dudley Felton** have been appointed joint managing directors of the Revo Electric Co., Ltd., in succession to the late Mr. A. E. Felton. **Mr. D. J. Vaughan** has resigned from the board.

Mr. D. S. Kirkpatrick, Western Regional sales manager of C. C. Wakefield's Industrial Oils department, won the South Wales Institute of Engineers' Annual Golf Meeting Championship at Porthcawl on July 12.

Lancashire Dynamo and Crypto (Mfg.) Ltd. have appointed **Mr. A. J. Beanland,** B.Sc.(Tech.), A.M.I.E.E., A.M.I.P.E., as assistant general manager of the Trafford Park Works as from September 1 next. Mr. Beanland received engineering education at the Manchester College of Technology, graduating in electrical engineering in 1932. He then took an apprenticeship course with L.D.C. Ltd., and has since been in the continuous employment of the company. His latter appointments have been as district sales manager in Leeds and manager of the L.D.C. fractional h.p. motor factory.

Mr. A. J. Beanland

Three new appointments are announced by Crompton Parkinson Ltd. **Mr. J. B. Scott,** D.F.C., A.I.E.E. general sales manager of Plant Division has been appointed an executive director of the company; additionally he will take up a new appointment as assistant sales director (home) as from October 1, next. As from that date **Mr. C. A. J. Martin,** G.C., M.C., B.A., A.M.I.E.E., M.INST.R., will become general sales manager, Plant Division, and his present position of product sales manager, f.h.p. motors will be taken over by **Mr. R. V. Powditch,** O.B.E., T.D., A.M.I.E.E., A.I.Mech.E., at present product sales manager, Nelson Stud Welding. Mr. J. B. Scott joined Crompton Parkinson in 1939 as a plant sales engineer, later enlisted in the R.A.F. and won the D.F.C. twice. In February 1946, he was made manager of Manchester plant branch and a year later branch manager, London office. He was promoted to general sales manager, Plant Division in 1948.

OBITUARY

Mr. H. C. Marillier, who died on July 27, aged 86, was Editor of *Lightning* (later re-named THE ELECTRICAL TIMES) from early in 1892 until October, 1893. His predecessor retired only a few months after the birth of the journal in 1891. A Cambridge man, he was a writer of lively prose and neat, witty verse, with many friends among the young literary and artistic lions of the Nineties. He had a subsequent successful career in literature and applied art, and was a member of the Athenaeum, where in 1939 the present writer had the pleasure of a chat with him about old times.—R.W.H.

Mr. H. W. Harris, Regional Manager of Philips Electrical Ltd., for the Manchester area, died on June 29, aged 58. He had been attached to Manchester for only eighteen months, but was already well known in the area. It was, however, in Yorkshire that he was best known, for he had been manager of Philips Leeds branch for many years before he moved to Manchester.

Mr. T. F. Altham, M.I.E.E., managing director of Transformers and Welders, Ltd., which he founded in 1937, died on July 22, aged 52, as the result of an accident in his yacht at Chichester. He was the inventor of the Hackbridge-Altham protective system and a number of other transformer and cable developments, for earlier he had been with the English Electric Co., and for many years with Hackbridge Electric Construction Co. He was chairman of the Transformer Section of B.E.A.M.A.

Mr. J. E. Starkie, A.M.I.E.E., who was borough electrical engineer at Burnley from 1905 until retiring in 1942, died on July 21, aged 74. The Burnley Electricity Department was Mr. Starkie's fourth place of employment when he joined it in 1901, and when he succeeded Mr. Birkett in June 1905, he was the fourth engineer to take charge of the undertaking. Under his guidance the undertaking steadily expanded, and additional generating plant was installed, but, precluded from erecting a new generating station, a grid supply was later taken to supplement the town's own output. The undertaking was among the first in the country to obtain Parliamentary powers to sell electrical appliances and instal wiring, and it became one of the leading authorities among towns of comparable size in the number of domestic appliances in use.

BRITISH STANDARDS

Enamelled round copper wire. *B.S.* 156 : 1951. *Price* 3*s.* This new edition differs from that of 1943, in that it has been extended to include the full range of wire sizes from 0·001 in. to 0·160 in. inclusive. It gives details of diameters, resistances, and thickness of enamel (including tolerances), together with tests on the enamel insulation. These tests relate to hardness, flexibility and adherence, heat shock, cold test at 0°C, heat ageing and electric strength. The standard sizes of wires complying with this specification are given in s.w.g., and in an appendix are given details of a range of wires complying with Brown and Sharpe gauges.

Round strand steel wire suspension ropes for lifts and hoists. *B.S.* 329 : 1951. *Price* 3*s.* This revision of the standard, which was previously revised in 1939, was undertaken at the request of the Lifts, Hoists and Escalators Committee for the inclusion of eight strand ropes and ropes having a tensile range of 70 to 80 tons/sq in., the tensile ranges now included being 70 to 80 and 80 to 90 tons per sq in. A departure from previous practice is that this revision now expresses the size of rope by the diameter and not by the circumference, a change which is considered to be in the best interests of all concerned and which now brings British practice into conformity with the current practice in other countries.

Electroplated coatings of nickel and chromium on steel and brass. *B.S.* 1224 : 1951. In view of the shortage of nickel which has developed a special meeting of committees of the British Standards Institution concerned with the preparation of appropriate standards was held in order to determine what steps should be taken. The meeting was unanimously of the opinion that B.S. 1224, electroplated coatings of nickel and chromium on steel and brass, the only standard at present published in relation to such coatings, should not be amended, but that a memorandum should be issued drawing attention to the provisions of the standard, which enable the amount of nickel used to be reduced.

Electroplated coatings of cadmium and zinc on iron and steel. *B.S.*1706 : 1951. *Price 2s. 6d* This document deals specifically with protective coatings on electroplated articles. It does not cover coatings on sheet, strip or wire. The foreword points out that cadmium and zinc each have specialised fields of service, and, therefore, the metal and class of coating should be chosen to suit the intended purpose.

The committee preparing the standard realised that it was impossible at present to specify completely every factor affecting the performance of an electroplated coating, but in view of the urgent demand for some basis of comparison for such coatings the standard is being published in its present form for the assistance of manufacturers and purchasers.

The British Standard covers the essential qualities of the coatings in question, stipulating limits for the purity of the coatings, the finish and appearance of the plated surface, the thickness and adhesion, together with appendices giving the methods of test. A section is also included dealing with the passivation of zinc coatings.

British Standards *specifications noted above may be obtained at the prices quoted from the British Standards Institution, Sales Dept. 24 Victoria Street, London, S.W.1.*

NEW LITERATURE

Polyphase Commutator Machines

by B. Adkins, M.A., M.I.E.E., A.M.Inst.C.E. *and W. J. Gibbs*, D.Sc., M.I.E.E.

NEITHER of the authors requires any introduction to the serious student of electrical machines : their I.E.E. paper read a couple of years ago will long rank as a classic exposition of the commutator machine. The present work commences with the extension of basic induction motor theory to cover the effect of an injected secondary voltage, followed by a study of the type of windings used. Classification of the main types of machine, defined in terms of the windings used, with some details of each type of machine is followed by two chapters dealing with special problems, such as commutation, self-excitation and hunting phenomena common to all types. Three further chapters discuss the three main groups—shunt and series motors, commutator frequency changes and the Schrage motor, and the Scherbius machine—more fully, with practical details and control, while the last three chapters deal respectively with phase advances techniques and with applications. Published by Cambridge University Press at 200 Euston Road N.W.1, 244 pages (125 illust.) 8½ in. by 5½ in. Price 21s.

Radio Circuits

by W. E. Miller

THIS is the third edition of this most popular book, which was first published in August, 1941. It deals principally with the superhet receiver, working systematically through it from aerial input to audio output stage, and dealing with each in section in a clear, simple and straightforward manner. Little previous knowledge of radio circuits is required by the reader, and sufficient data are given in the text on typical values of circuit components to enable a good idea of the practical side to be obtained. The book does not pretend to be a design manual, and for that reason, is singularly clear of the somewhat alarming formulae frequently encountered in receiver manuals. This latest edition has been brought up-to-date, and a new chapter describes the modern all-dry battery portable, recent a.c./d.c. battery sets, and band-spread and automatic tuning. Published by the Trader Publishing Co., Dorset House Stamford St. S.E.1. 120 pages. 8¾ in. by 5½ in. Price 5s.

Wiring Circuits

by E. Molloy

IN the course of their careers electrical contractors, installation and maintenance engineers come upon many wiring problems of varying complexity. Some may be simple matters of lighting, others may involve starters, battery chargers, crane control and so on. The purpose of this volume is to present, in a simple and practical manner the circuits associated with all general problems of this nature, and this it fulfils admirably. Starting with supply systems for domestic and industrial premises—including ring main circuits to I.E.E. Reg. 201 (c)—the author continues with lighting controls, sign circuits (both for filament lamps and discharge tubes), time switches and alarm and indicator circuits.

On the industrial side are details of motors and motor control circuits transformer and rotary converter connections, voltage regulators, rectifiers and battery charging systems. For the installation engineer, information is given regarding crane control, thermostatic control of water and space heating, and electronic and other special circuits. The final chapter is devoted to welding and welding circuits. Published by George Newnes Ltd., 216 pages, 8½ in by 5½ in. Price 10s 6d.

Modern Fluorescent Lighting

by A. D. S. Atkinson, A.M.I.E.E., F.I.E.S.

AS one of the Lighting Service Bureau's more prominent technical men, Mr. Atkinson and his work need little introduction to electrical engineers in general or illumination engineers in particular. Intended for engineers and architects, as a basic work on the principles and practice of fluorescent lighting, the book deals very thoroughly not only with lamps themselves, their characteristics and operation, but with the broader canvas of illumination design, fittings and their performance and a contribution to the cold-hot cathode controversy. A novel departure is that unlike most text-books the theory of light and the mechanism of electric discharge is left to the end as "optional" reading instead of being dealt with first and so tending to disconcert those readers who wish to concentrate upon practical considerations and tend to shun theory. There are six appendices of tables including coefficients of utilisation; room indices; choke, capacity, resistor, and lamp data. Published by George Newnes Ltd., of Tower House, Southampton Street, W.C.2, 159 pages, 8½ in. by 5½ in., 64 illustrations. Price 15s.

BOOKS RECEIVED

Fractional Horse Power Motors, by S. F. Philpott, deals with construction and application of various types without detailed attention to theory. Published by Chapman and Hall, 367 pages, 8½ in. by 5½ in. Price 30s.

Fundamentals of Automatic Control, by G. H. Farrington. General survey of field, fairly mathematical, with reference to underlying principles rather than with specific details of plant or apparatus. Published by Chapman and Hall, 285 pages, 8½ in. by 5½ in. Price 30s.

Elementary Electrical Engineering, by A. E. Clayton and H. J. Shelley. Text book for ordinary National Certificate standard; numerical examples are included. Published by Longmans, Green, 490 pages, 7½ in. by 5 in. Third edition, price 14s.

LUBRICATION OF STEAM TURBINES

THE oil in steam turbines performs several duties. Apart from its primary and obvious function of reducing friction and wear between opposed working surfaces it has also to serve as a coolant, a corrosion preventative, and as a hydraulic working fluid for the operation of governors, valve gear, overspeed trips and emergency gear. To perform these duties, the main qualities required are high oxidation stability, good demulsibility, rust preventative and anti-foaming properties and the appropriate viscosity.

Among the producers of turbine oils, Shell have recently issued a comprehensive book on the general subject of "Lubrication of Steam Turbines." This volume covers all aspects of the oil and lubrication systems of most types of turbine ranging from 100 h.p. up to large power-station sets. Apart from an introductory section dealing with grease-lubricated ball and roller bearings for small machines, the main section is devoted to pressure circulating systems and four arrangements are considered. These are (1) direct feed with pump driven by the main turbine; (2) gravity feed with independent pumps; (3) combined gravity and direct feed with independent pumps and (4) direct feed with independent pumps. Of these the first is associated with land practice and the remainder are encountered with the main engines in marine practice. Details of all these types are given together with diagrams to explain the systems adopted.

Special attention is paid to oil baffles and throwers and to bearing design. Problems of lubricating couplings and thrust blocks are also discussed at some length.

Coming to smaller items, the book covers ancilliary equipment such as pipes, mechanical and magnetic strainers, coolers, oil reservoirs and oil pumps. The use of oil as an operating medium is then dealt with, and the next and largest section of the volume is devoted to the causes of oil degradation and their avoidance. Hints on maintenance and operating procedures, and methods for purifying the oil follow, and the final—and to many electrical engineers the most important—section of the book is concerned with hydrogen sealing for hydrogen-cooled alternators.

The booklet, produced by The Shell Petroleum Co., Ltd., is available to those genuinely interested in the United Kingdom from Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, London.

Light Beams Guard Presses

MAINTENANCE engineers with an interest in electrically-operated machine guards and interlocks will no doubt recall the discussion by Mr. W. Fordham Cooper (Factory Inspectorate) of photo-electrically operated devices in his I.E.E. paper, "Electrical Control of Dangerous Machinery and Processes: Part II—Electrically Interlocked Guards on Machines." In this he listed objections to the application of these devices to form a trip guard consisting of interlacing reflected beams. The main objections were ease of defeat by an electric torch, sensitiveness to background illumination, and difficulty of arranging for failure to safety and immediate machine braking.

Recently a design was patented by Mr. S. A. Morris, chief designer of the Witton Kramer Electric Tool and Hoist Works (G.E.C.), which appears to answer these objections.

The equipment consists of two vertical columns situated one at each side at the front of the press. Mounted on one column is a lamp house which projects a modulated ray of light on to a mirror across the space dividing the two upright columns. This ray of light is then reflected backwards and forwards until the whole area between the two upright columns is forming a barrage of rays. The reflection from the final mirror is projected on to a photo-electric cell and by means of valve amplification a relay interlocks the operation of the press. This means that as long as any part of any person is within the space between the trapping surfaces of the tools, it is not possible for the slide to be brought into motion by power.

In the event of the operator accidentally placing his hand in the danger zone whilst the slide is descending under power, the slide will be brought to rest before his hand reaches the space between the tools. This is achieved by means of a solenoid declutching the driving shaft and immediately applying a brake. After tripping in this way, it is not possible for the slide to be set in motion again by power until the safety device has been completely restored to its normal condition and the clutch control mechanism has been restored to the clutch disengaged position. This equipment is provided with an automatic checking device interlocked with the operation of the press, which functions once at each complete stroke of the press.

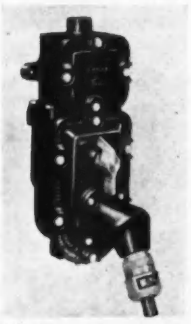
This checking is achieved by means of a cam mounted on the main shaft of the press. The cam is arranged to interrupt the ray of light from the projector for a short period towards the end of the operational cycle, and action of the relay is checked by an interlocking system. Thus a complete test is given to the whole equipment once in each cycle ensuring safety of the operator.

The object of using a modulated light ray is to avoid the photo-electric equipment being affected by stray light or external light conditions.

The BUYER'S *Column*

Medium Voltage FLP Switch Sockets

NEWCOMER to the range of small capacity medium voltage flameproof gear produced in the United Kingdom is a flameproof switch socket and plug introduced by SIMPLEX ELECTRIC LTD., Broadwell, Oldbury, Birmingham.



FLP plug and socket by Simplex Electric

Complying with B.S. 229/46 and C.P. 1003 the switch socket and plug is covered by Ministry of Fuel and Power certificate No. 2699 for group 2 gases. It was produced to meet a need for a unit for supplying 250 V apparatus by means of trailing cables of the heavy t.r.s. type.

Wiring in the switch socket has been kept as simple as possible whilst the plug has provision for screened cable with a special safety cable retaining clamp. The plug is also fully interlocked and there is full flameproof protection of the pins and sockets during withdrawal until the circuit is broken.

The switch socket is in a robust grey iron case, the switch being operated by a powerful self-indicating hand which operates with the plug as part of the interlocking. The plug itself comprises a powerful cast body in two portions with skirted pins. The earth pin which has a terminal hole to receive the earth core also has a factory made clamp for making contact with the cable screening.

For conduit entry a spout is provided tapped ¾ in. E.T. as Standard. This can be used with conduit or Pyrotenax "G" gland. The finish is black stove enamel or galvanised.

A Boon for the Tea-drinker

AN interesting introduction which will be very useful to the tea-drinker, and that includes nearly all of us, is the "Thermakozy," an electric tea cosy which has been marketed by OLIVER BATTENBERG AND CO., 6 Great Winchester Street, London E.C.2.

Made in the shape and style of the conventional insulating tea cosy, the Thermakozy is attractive with its colour contrasts and fine embroidery, yet it really does a good job in keeping the teapot or other container piping hot for several hours at a negligible cost.

It is rated at 35 W and is for 200/250 V a.c./d.c. supplies. Price for such a boon is indeed modest at 58s. 6d. including purchase tax.

Other uses for this novel aid are keeping the food or drinks of invalids warm, keeping baby's bottle warm throughout the night, ensuring a nightcap is ready when you come home from the show, and making sure that there is a hot cup of tea awaiting you first thing in the morning.

R.G.D. 1800 Aristocrat of T.V.

RELEASED to the home market a few weeks ago was a new addition to the range of models produced by the RADIO GRAMOPHONE DEVELOPMENT CO., LTD., Bridgnorth, Shropshire.

It is a console model receiver, the "1800," and it is a 17-valve (plus metal rectifier) superhet model incorporating a 12 in. aluminised c.r. tube and a 10 in. p.m. speaker with built-in suppressors on both sound and vision frequencies.

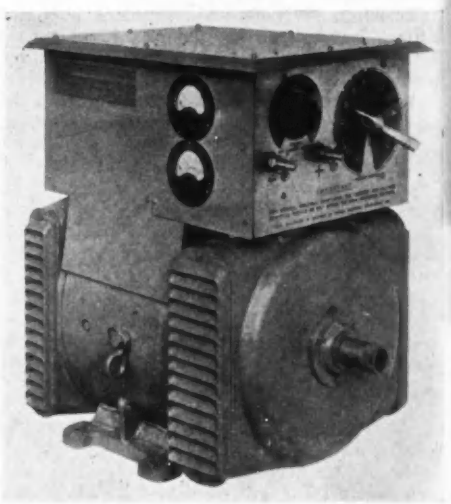
Cabinet is of selected walnut with full-length doors concealing the tube face, loudspeaker and controls when not in use. Dimensions: 34 in. × 20 in. × 18 in. deep and price £112 7s. plus £51 2s. 5d. purchase tax.

Welding Generator Sets

MAX ARC AND ELECTRICS, LTD., 190 Thornton Road, Croydon, Surrey, have added an attractive series of d.c. sets to their range of electric arc welding equipment. It includes d.c. generators for belt or engine drive, also a.c./d.c., and d.c./d.c. motor generator sets.

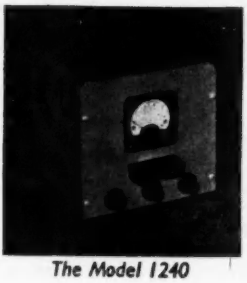
The generator embodies a neat control panel on which is mounted practical independent voltage and current controls. This power unit provides a high striking voltage which ensures perfect arc stability with all types of electrodes under adverse conditions. The equipment is waterproof and is available in a wide range of sizes.

An example of the new Max Arc range



Runbaken's 1240 Charger

AN addition to the company's range of trickle chargers is the Model 1240 produced by RUNBAKEN ELECTRICAL PRODUCTS, 71-73A Oxford Road, Manchester.



The Model 1240

This new development has a charging rate up to 5 amps. It embodies the characteristics of the more well-known Runbaken models, has a smart appearance, and is of robust construction. Fully guaranteed and available for prompt delivery, the list price is £7 12s. 6d. retail.

The Fisher Rotary Post Ironer

FOLLOWING on the introduction of the Hotpoint model RL rotary ironer, H. FISHER (OLDHAM) LTD., Oldham, Lancs, will introduce the new Fisher rotary post ironer as an optional accessory for attachment to the Fisher standard and de luxe washers.

As the result of an agreement between the Hotpoint Electrical Appliance Co., Ltd., and H. Fisher (Oldham) Ltd., this already proved and tested appliance will form another addition to the Fisher range.

The ironer can be mounted in place of the wringer, and will operate from the same drive shaft. Quickly mounted and of 1,200 W consumption, it is ready for use within five minutes of switching-on. Temperatures are automatically controlled for a wide range of fabrics, and can be pre-set by means of the thermostat mounted on the back of the stainless steel ironing shoe. Pleating and pressing can easily be accomplished with the roller stationary, and the roller cover is removable for washing. The operating mechanism is enclosed in a pleasantly styled and easy-to-clean grease-tight body.

The Home Trade list price of the ironer will be £21, plus purchase tax of £10 18s. 5d.

13 Amp. Adaptor by M.K.

NOW being marketed by M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London N.18, is a new 13 amp. adaptor List No. 696.

It has two 13 amp. outlets flat pin type for B.S.1363 each embodying M.K. Anti-flash shutters. Robustly moulded in non-crack plastic material, the adaptor has a pleasing unobtrusive appearance, projection being kept to a minimum.

List price is noted as 95s. per dozen.

TRADE PUBLICATIONS

ACCUMULATORS.—Open-type stationary cells by Tudor Accumulator Co., Ltd., 50 Grosvenor Gardens, London S.W.1, are listed by types and dimensions in a publication by the company.

LIGHTING FITTINGS.—The Prismatic bulkhead fittings leaflet issued by Simplex Electric Co., Ltd., has recently been redesigned. Copies are available from the company.

FLEXIBLE COUPLINGS.—A leaflet illustrating the gear-type flexible couplings recently standardised in series by the company, is available from David Brown and Sons (Huddersfield), Ltd., Park Gear Works, Huddersfield.

SWITCHGEAR.—A recent publication of the English Electric Co., Ltd., Queens House, Kingsway, deals in detail with the English Electric outdoor oil circuit-breaker.

PLASTICS.—Ekco is a well-known name in the "moulding for the trade" business. A recent brochure by the company, E. K. Cole, Ltd., Plastics Division, Southend-on-Sea, sets out the whole story of this enterprise.

CONTROL GEAR.—Motor starters, regulators and braking gear is the subject of a publication by Morecambe Electrical Equipment Co., Ltd., Westgate Works, Morecambe.

FANS.—"Coolness in 1951" is the appropriate title of a recent pocket booklet describing the range of fans available from Sloan Electrical Co., Ltd., 41 Kingsway, W.C.2.

METERS.—Copies of two new catalogues being distributed to their customers by the Electric Meter Company, Castor Road, Brixham, South Devon are now available. The first with a buff cover deals with reconditioned meters for the home trade, whilst that with the red cover deals with meters for the export market.

RECORDING INSTRUMENTS.—List No. 248, issued by Evershed and Vignoles, Ltd., Acton Lane Works, Chiswick, W.4, describes Evershed operation recorders. These automatically plot on a single chart a two-position record, showing on a time basis the frequency and duration of any operation to be studied.

NICKEL ALLOYS.—Issue No. 330 of "Wiggin Nickel Alloys", a publication by Henry Wiggin and Co., Ltd., Wiggin Street, Birmingham 16, includes an article on a slider-type resistance which was wound with Terry wire. After being submerged for four months the wire was found electrically perfect.

ELECTRICAL ACCESSORIES.—The 1951 catalogue of "Nettle" Accessories is available from Nettle Accessories, Ltd., at Harper Road, Wythenshawe, Manchester.

Welding Developments

TWO items in the April issue of "Welding Research," the journal of the British Welding Research Association, are of interest in showing the progress being made in this important field of engineering. The first of these, dealing with the development of a 600 amp Argon-arc torch for the manual welding of thick aluminium alloy plate arose because certain work for the L.M.1 committee of the Association required that welds be made in plate of ½ in. thickness and over. With the Argon-arc equipment, available commercially, which had a maximum capacity of about 300 amps, it was just possible to prepare single pass welds in ½ in. material if preheating was employed. However, preheating is an undesirable complication in research work and is often difficult to employ in practice. It was decided, therefore, to design and make a torch which would handle much higher welding currents. The torch has a water-cooled metal nozzle and is constructed so that the tungsten electrode can be changed from the back of the torch without disturbing the nozzle. Electrodes of up to ½ in. diameter can be fitted, but ⅝ in. diameter is the largest size that has been used as yet. Single pass welds have been made in plate up to 1 in. thickness and the torch appears to be very satisfactory in operation.

Flash Welding Alloys

The second article is a "Review of Machine Characteristics for Flash Welding of Light Alloys". Joining of aluminium and aluminium base alloys by resistance flash welding has, until recently, been considered a difficult, if not impossible, process. It has now been shown, however, in the U.S.A. and this country, that flash welding is both possible and practicable. This review was initially prepared some 18 months ago to summarise existing published information and to encourage interest in the application of the process. Subsequently, valuable research work has been completed by Hess and his associates at the Rensselaer Polytechnic Institute (U.S.A.) which has greatly added to the knowledge of flash welding. Only the initial results of these researches are included in the review, but a more complete acknowledgement will be made in a subsequent report.

Many of the published research reports on flash welding are of American origin, but the lack of data from British sources must not be taken as an indication of the absence of development in this country, e.g., the use of flash welding in window frame and bicycle rim construction is well established.

The review concludes that the basic differences between flash welding of steel and light alloys are the same as exist for spot welding, i.e., current, time and pressure. High currents, short accurately-controlled current duration and accurately-controlled upset are essential requirements for the flash welding of light alloys, but in the other extreme there is some evidence in favour of the slow-butt welding process in which a less rigid control may be possible with some materials.

Street Lighting at Laycock

THE Cotswold village of Laycock is one of England's most treasured beauty spots. It is National Trust property and is visited by many thousands of tourists every year.

Great attention is, therefore, paid to maintaining its character, and when it was decided to improve the street lighting, it was a requirement that the design of the lantern should be such as to blend with the surroundings and that its support, whether column or bracket, should also harmonise. After considering a number of designs, a simple bracket type of lantern was installed. Prismatic glass refractors are used to give the necessary light distribution. The illustration shows that it is possible to design efficient street lighting to blend pleasingly with old-world charm. The lanterns were designed and manufactured by Siemens Electric Lamps and Supplies Ltd., and installed by the Southern Electricity Board.

Plastic Telephone Cables in Denmark

A NEW all-plastic type of carrier-frequency multi-quad underground cable is being laid by the Copenhagen Telephone Company as part of a large scheme of expansion of the company's communications system. Two cables, one for each direction of transmission, have been developed and manufactured by the Telegraph Construction and Maintenance Co., Ltd., at Telcon Works, Greenwich. The cables are insulated and sheathed with Telcothene, and are designed to provide 48 speech channels per pair in frequency band from 12 to 204 k c/s, giving a total of 1,152 circuits for the two 12-quad cables.

Conductors of diameter 0·04 in. (25 lb/mile) were chosen instead of the usual 0·05 in. (40 lb/mile) since the distance necessitates an intermediate repeater in either case.

Each copper conductor is insulated by an extrusion of Telcothene to a diameter of 0·102 in. opposite cores in any one quad being coloured similarly for identification of pairs. Four cores are laid up round a separately extruded Telcothene cord to form the quads, which are left unfilled so that there are air spaces in the interstices. Twelve quads are laid up, three in an inner layer and nine in an outer layer, and bound together with a thin Telcothene tape. Over this is extruded a tubular Telcothene sheath of 0·065 in. radial thickness, which is applied sufficiently tightly to lock the quads lightly into position, thus ensuring during subsequent processing and laying the stability essential with a high-grade balance. A screen of thin copper tapes is lapped over the sheath and protected by alternate layers of compound and bitumenised paper tape.

For laying in trench, the cable is served with compounded jute, armoured with two steel tapes each 0·03 in. thick, and finished with two compounded hessian tapes. The overall diameter is approximately 1·63 in. and the weight 4 tons per mile. For drawing into ducts, the cable is finished with an outer sheath of polyvinyl chloride of 0·10 in. radial thickness, extruded directly over the copper tape screen. In this case the overall diameter is approximately 1·35 in. and the weight 2·2 tons per mile.

The light weight of the cables, due to the absence of a lead sheath, makes installation very easy. Two lengths of 250 metres were pulled into the trench in half an hour, the maximum tension being only about 400 lb, a fraction of what the cable will stand without harm. This means that it can be laid in about one-fifth of the time it would take to lay lead-covered paper insulated cable of the same size under similar conditions, thus reducing considerably the cost of installation.

A method of jointing by injection moulding has been developed, suitable for use in the field, when the heat required is supplied by current from a 2 kW petrol-driven generator.

STEAM TRACTION DYING IN CANADA

WITH forty diesel locomotives ordered in 1951, the Canadian Pacific Railways steam-diesel conversion scheme is progressing in accordance with the $68 million programme first announced in 1950. Delivery of these will bring the number of main line diesels in Canada up to 230. The decision to convert to diesel working has brought a new industry to Canada, and three firms are now major producers of these locomotives—Canadian Locomotive Co., Montreal Locomotive Works and General Motors Diesel Ltd.

Later this year, 28 units will be delivered to power freight and passenger trains on the Laggan and Mountain sub-divisions in the Canadian Rockies between Calgary and Revelstoke. These will replace the Selkirk steam locomotives, largest in the British Empire, and among these will be No. 5935, probably the last steam locomotive to be bought by the Canadian Pacific.

Although the company has whole-heartedly adopted the substitution of diesel traction for steam, careful watch is being kept on the gas-turbine locomotive which may eventually have advantages comparable to or even greater than the diesel for operation under Canadian conditions.

An unusual feature of the conversion programme is that instead of running "named" diesel-electric passenger expresses the company embarked on a policy of conversion by areas. This developed from experience gained when the subsidiary Esquimalt and Nanaimo Railway on Vancouver Island was completely converted to diesel working in 1948. As this subsidiary was completely isolated from the C.P.R.'s main line runs, experimentation and testing could be carried out without affecting transcontinental traffic.

Following the success of this first trial, the next move was to change over on one of the main lines—Montreal-Boston—and from then on progress was rapid. By mid-summer 1949, all the heavy interchange freight traffic carried via Wells River, Vt., and Windsor, Ont., was being handled by eight 1,500 h.p. streamlined "A" units, four "B" units, five 1,500 h.p. road switchers and three yard switchers. Passenger services followed later in the year when three 2,250 h.p. streamlined units went into service between Montreal and Boston.

In Nov. 1949, a $12 million order for 58 diesel units to be used on freight service between Fort William, Ont., and Cartier, Ont., was placed and this was completed during 1950. These diesels replaced 68 steam locomotives now being used on other sections of the system.

Operating experience has been most satisfactory. Climatic conditions over the Schreiber division, north of Lake Superior, presented the diesels with the most severe winter tests, but they stood up to it well, and maintain the heavy flow of traffic over this vital continental link.

THE WEEK

COMMERCE *in news* INDUSTRY

Returns of Iron and Steel

WITH the object of collecting information on which future allocations will be based, the Minister of Supply has made an Order calling for returns of iron and steel consumed during the first six months of this year, corresponding stocks and the estimated requirements for the following nine months. The submission of these returns is a statutory obligation and must be done by August 22. The Iron and Steel Utilisation (Information) Order calls for two returns: Return A is required if an undertaking consumed over 25 tons of non-alloy iron and steel, and a separate return is required of all those metals, including alloy iron and steel consumed and held in stock in each of the undertaking's works and stockyards. Return B must be made if a firm consumed either five tons of alloy iron and steel or 1,000 lb of high-speed steel. A separate return is necessary as in the previous case. They are not required from works using these commodities only for the main process of iron and steel manufacture, for non-alloy iron castings, or from scrap merchants, stockholding or distributing merchants or warehousemen. Firms which have not received the forms by August 8 should contact the appropriate Regional Controller immediately.

S.E.B. Tariff Approved

THE new standard domestic tariff which the Southern Electricity Board proposes to put into operation in October next was approved by the Area Electricity Consultative Council at its meeting last week. The basis of the tariff is a charge of 5d. for the first ten units per room per quarter, with additional consumption at 0·875d. p.u. The Council also discussed the question of charges for street lighting, and after one member had pointed out that at Oxford, for instance, the Corporation would be faced with an increase of over £2,500 a year, a resolution was approved expressing the opinion that public street lighting should be provided by the Board as near as possible to cost.

Electricity Economies next Winter

OFFICIALS of organisations representing industrial, commercial and domestic consumers met the Minister of Fuel and Power last Thursday to discuss methods of economy necessary during peak periods next winter. Factories and large commercial firms will be asked, as before, to spread their load by various means, particularly by transferring certain operations from peak to off-peak hours. This, however, was impossible among domestic consumers who nevertheless accounted for a large proportion of current. As it was imperative that everyone should share in the effort to effect economy, it was decided to set up regional committees to keep in touch with all consumers, and to keep the problem before the public eye. These committees would comprise members of the organisations attending the conference with representatives of the Boards and Regional Boards for Industry, and would probably begin to function by the end of September. Appropriate advertisements would continue to be the Electricity Boards' responsibility.

The previous day, the Minister of Labour told the National Advisory Council for Industry that unless new steps were taken to ease the load, the country would face a large-scale industrial shutdown. Special attention would have to be directed on staggered hours and shift work.

Resale Price Maintenance

TRADE associations and firms who have evidence of special circumstances which they would like to bring to the Government's notice before the proposed legislation on Resale Price Maintenance is introduced, are being invited to contact the Board of Trade. Discussions are at present taking place between the B.o.T. and those associations dealing in goods to which special consideration may apply. These goods include electrical appliances and radio and television sets. The Board does not want statements or comment upon the general arguments involved, but information concerning special consequences and difficulties which might follow legislation. Firms should contact the Assistant Secretary, B.o.T., I.M.I.A. Div., Thames House, Millbank, S.W.1.

Notes for Contractors

AS from September 3, the country allowance for journeymen electricians, mates, etc., is to be increased by 6d. to 6s. per night. This was decided at the meeting of the National Joint

The First Half-Century

After a long inquiry the House of Commons Committee has passed the Manchester and Liverpool Electric Express Railway Bill, and the line will be constructed. The real question at stake is rather one of railroad construction than of electrical engineering. The so-called mono-rail is anything but a new idea, it has been before the railway world for years. Electric working is a necessity for any high-speed railway, and it is in no way special to the Mono-rail.—*From our issue of August* 1, 1901.

Industrial Council last month. At the same meeting it was also agreed to increase the minimum chargehands' rate from 2½d. to 3d. per hour as from August 13.

The National Federated Electrical Association also point out that operatives who are not required to work on August Bank Holiday Monday (or Tuesday where that day is substituted) are entitled to a normal day's wages in respect of that day. Employees called upon to work on that day are entitled either to pay at time and a half plus a day off in lieu, or pay at two and a half times normal rate, at the discretion of the employers.

A Social Occasion

A happy occasion took place last week when the residents of Broom Park, the E.I.B.A. estate, were at home to a small party of guests. Visitors had an opportunity of inspecting the delightful and spacious grounds and the social occasion provided an opportunity of assessing at first hand the valuable work the E.I.B.A. has done in providing such delightful surrounds for those who have passed into the age of retirement. The visitors were particularly grateful to their hosts for a most pleasant afternoon.

Plans for 1952 B.I.F. going Well

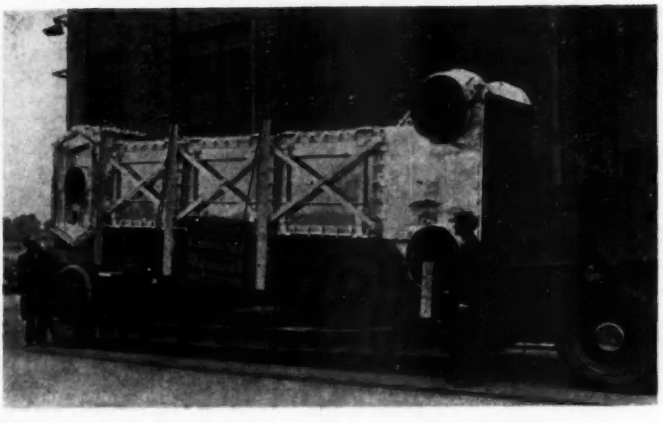
WITH this year's B.I.F. only three months old, it seems strange to report that arrangements for the 1952 Fair are now well in hand and prospects clearly indicating an even more impressive and comprehensive show. Early reports reveal that one-third of available space in London has already been sold, while in Birmingham bookings are slightly higher than last year, when a peak level of bookings was recorded. We remind intending exhibitors that applications for space should be received by the organisers before August 25. We note, too, that the Fair's promotional campaign is to be extended in North America to Canada, a market which has assumed increasing importance in recent years, and a special advertising office is to be set up in Toronto for this purpose. The 1952 Fair will take place between May 5 and 16.

Meeting denounces New Tariffs

A MEETING convened to consider the new tariffs proposed by the Midlands Electricity Board, to which sundry objections have been raised over the past few weeks, met last Friday. Fifteen local authorities were represented at the conference, at which the Mayor of West Bromwich, whose council instigated the proceedings, presided. Two resolutions were passed. The first expressed dissatisfaction with methods of consultation prior to introducing new charges, and urged that the Act be amended in this respect and that M.P.s be asked whether they would give their support to such a proposal. The second asked for the establishment of an independent body to consider applications by Electricity Boards for tariff revisions. This, it was said, was to safeguard the public. The chairman explained that it had been found that increases among the working classes often amounted to 85% or 100% or even higher in what the consumer of the lower rated house would have to pay. It was the method of assessment more than increased prices which was the cause of objection, said one delegate, because it affects the lower income groups most.

New Company for Tungsten

IT has been announced that as from last Monday the Ministry of Materials would be the importer of tungsten ores and concentrates. Private imports of tungsten will not be permitted under normal circumstances in future, although they will continue to be allowed under licences already issued. Import and distribution will be conducted through agents drawn from the trade, and to implement this it is proposed to form a company. Management of the company is to include representatives of Derby and Co. Ltd., Metal Traders Ltd., and H. A. Watson and Co. Ltd., all London firms, the latter also having a Liverpool office. Meanwhile, offers of tungsten may be made to any of these firms, who will make bids on behalf of the Ministry.



The heat-exchanger of the gas turbine for Anglo-Saxon Petroleum tanker "Auris," leaving B.T.H. Rugby works last week for Newcastle, where the company's gas turbine alternator is being assembled. It replaces one of the four diesel-alternators installed in 1948. The gas turbine alternator is being installed in order to obtain operating experience with a main propulsion gas turbine set under service conditions in sea-going vessels

A corner of Wall Paper Stores Ltd., Oldham, lighted by a combination of Mazda fluorescent and tungsten-spot lamps. Forty-one of the firm's shops have now been illuminated in this way

Batti-Wallahs talk Sport

AT the Batti-Wallahs' luncheon last week, the principal guest, the Rt. Hon. Oliver Lyttelton, chose as his theme "The Influence of Sport on the British Character." In a most lively and jocular manner he tore down many of the general ideas held on the subject. He deprecated, in a humorous manner, the adulation and respect accorded to prominent figures in the sporting world, citing the civic welcome given to Randolph Turpin after his victory by the Mayors of Warwick and Leamington Spa, as an example of disproportionate hero-worship. To the statement that qualities of leadership were induced by sport, he queried the number of captains of teams who had ever attained a position of power in any other sphere, and on leadership itself, he stated that it was the power to develop a state of unreason in the minds of the followers. The next Batti-Wallahs' luncheon will not take place until September 26.

Popular form of Shop Lighting

A COMBINATION of fluorescent and tungsten-spot lighting supplied by the British Thomson-Houston Co., has proved to be an effective and popular method in the shops of Wall Paper Stores Ltd. The latest branch of this firm to be so fitted is in Market Place, Oldham, and was the forty-first of the company's stores in which similar installations have been carried out. A total of 34 colour matching fluorescent lamps were used and have been concealed by a canopy with an under surface of reeded glass and a frosted glass roof. The canopy is eight feet above the floor, and at this height also a number of 150 W reflector spotlights have been mounted in specially designed aluminium fittings. These serve not only to accentuate certain displayed goods, but also to give added warmth to the diffused fluorescent lights. The installation work in all these shops has been carried out by Percivalls Ltd., of Gerrards Cross, Buckinghamshire.

Contracts worth £1 Million

AN order valued at $600,000 for rectifier equipment for the U.S., has been obtained by the Hackbridge and Hewittic Electric Co. Ltd. Announcing this at the company's annual meeting last week, the chairman and managing director, Mr. Thomas F. Lister, pointed out that the contract had been placed after his statement circulated with the annual report for 1951 had been issued. Added to the order recently obtained from the Southern Region of British Railways, this latest contract means that during the past two months, orders for rectifier equipment amounted to some £1 million. This was over and above the normal demand from the firm's usual sources.

6,000 Electric Motors earn Dollars

A LARGE consignment of small electric motors left this country last week *en route* for the U.S., representing probably one of the largest dollar orders of its kind placed in this country. The contract was placed with the Hopkinson Electric Co. Ltd., and involved some 6,000 motors of between 1 and 7½ h.p. to be used in farms and rural houses all over the States. Total value of the order exceeds $500,000. Incidentally, Hopkinson's export contracts at present comprise over 70% of their total output. A second order valued at about £45,000 which is at present in the course of assembly is for larger motors of between 12 and 15 h.p., earmarked for India. These have been specially designed for inclusion in the "tube wells" irrigation scheme. It will be recalled that Hopkinsons became a member of the Brush A.B.O.E. Group at the beginning of last year.

Contract for Jan Smuts Airport

WHEN completed, the new Jan Smuts airport at Johannesburg will probably rank as one of the most modern in the world, rivalling the aerodromes of London and New York in its completeness of navigational aids and sundry other facilities. Work is now well under way and we note that a contract for the supply of all lighting and numerous other items of electrical equipment has been placed with the G.E.C. There are to be three runways in all—two will be provided with both high and low intensity lighting and equipped with the British line and bar system of approach lighting for use in poor visibility. The third will have low intensity lighting only, and tungsten lamps will be employed throughout.

A display of B.I.C.C. products on show to visitors during one of the company's "Open Weeks" recently. Two B.I.C.C. factories were thrown open last year and the experiment proved so successful that the scheme has been extended this year. Helsby works entertained 800 guests, while at Prescot 1,500 were received. An equally large crowd was expected also at the Anchor Works, Leigh, Nr. Warrington

Electrical equipment included in the contract comprises h.t. and l.t. switchgear, substation transformers, a control panel and all contactor gear for remote operation from the control tower. There will also be a 150 kVA standby diesel automatic generator to guard against a risk of power supply failure. Lights on the two main runways will be an elevated type combining high and low intensity systems in one unit, while on the third and the taxiway, lights will be flush mounted.

Open Day at Victoria Works

IN response to an appeal from employees, the Victoria Works of Johnson and Phillips Ltd., held an "Open Day" recently. Small parties were conducted through the various departments and each received a copy of "The Story of J. and P.," with a photograph of their own party to mark the occasion. Special demonstrations were given in the super tension laboratory and with the impulse research plants, where a model house was used to demonstrate mock lightning. A display of domestic appliances, products of British National Electrics Ltd. was on view in the canteen.

Radio Communication

OPENING the third session of the British Institution of Radio Engineers' 1951 Radio Convention, the chairman, Mr. P. Adorian, summarised the outstanding requirements of radio as more communications at greater speed, greater flexibility and lower cost. Unless radio communication systems were speeded up there was a risk that they would not be fast enough to deal with the problems of air communication. He said the flexibility required might best be illustrated by the fact that not only was it necessary to be able to interconnect radio channels in different wavebands, but also interconnection between radio channels and line circuits had to be arranged. He went on to say that one of the handicaps of radio communications, particularly for mobile systems, was that power units had to be relatively bulky and costly. This session closed on Friday, but will be followed by another at Cambridge later.

Greater use of Coal Urged

IN its report for 1950, the Coal Utilisation Joint Council states that load shedding and consequent inconveniences would have been largely avoided if solid fuel had been used to cope with those loads. Commenting on the campaign to secure the most efficient use of solid fuel in the home, the Council states that it was now realised how uneconomic and unwise it was to use fuels other than solid fuels for the main winter space and water-heating loads. During 1950, the report goes on, the Council considered how the installation of improved domestic solid fuel burning appliances could be stimulated. It would be desirable to make easy-payment terms more widely available to the public and on a par with electrical and gas equipment. The Government had been approached on the question of granting a limited extension of credit facilities for domestic solid fuel appliances.

Earthing to Taps

LOCAL residents and the E. Midlands Electricity Board are being warned by the Tamworth Waterworks Committee of the proposed use of asbestos pipes for water-supply purposes instead of the usual cast iron pipes when the latter are not available. The use of asbestos pipes would, of course, render ineffective the normal method of earthing electrical systems in houses. At a meeting of the committee last week a member pointed out that it might lead to firms committing offences against the Factories Acts unless they were aware of the installation of asbestos pipes. All such installations would be notified both to the Board and those concerned.

More Pay for Clerical Staff

AGREEMENT on salary increases for clerical grades has been reached by the Electricity Supply Industry National Joint Council (Administrative and Clerical Grades). The increases cover employees on the general clerical scale, shorthand and typing grades, and machine and telephone operators. They arose from an application for increases of not less than 20% to compensate for the rising cost of living. Claims of the higher clerical, administrative and commercial staff have been referred to the Industrial Court for determination. This announcement was made by N.A.L.G.O.

Abbey Lighting

IN our leading article "Steel from Abbey" last week, particular mention was made of lighting fittings by B.T.H. and G.E.C. We now learn that large numbers of "Diolux" fittings were supplied by Dorman and Smith Ltd., for passages and similar applications.

Radio Exports Rising

RADIO exports from this country during the first six months of this year showed an increase of 39·4% over the corresponding period last year and were five times the value of a whole year's exports before the war, according to the latest figures issued by the Radio Industry Council on Friday. These figures, based on Customs returns, reveal that the value of radio exports up to June 30 was £10,195,333. The greatest increase concerned radio receivers, which rose by some 74%, and we note that manufacturers have expanded their markets, particularly in South Africa, South America, Egypt and Malaya. Over £3 million worth of loose components were exported, of which some 10% went to the U.S. and Canada. Exports of valves rose by 54% and of capital equipment by 12·6%. The Council added that radios now formed the highest single group among exports of the British electrical industry.

Increased Productivity

PRIOR to their sailing on the return voyage to the U.S. last Saturday, the productivity team from the American pressed metal industry held a press conference to give a general picture of findings during their tour of Britain. All comments made were of necessity generalisations, for not until they have assessed and sifted all the data and impressions collected can they draw definite conclusions. The team comprised 15 members, and was led by Mr. F. C. Greenhill, president of the Acklin Stamping Co., Toledo. It spent just over a month in Britain, visiting a dozen or more factories, including those of Frigidaire and Joseph Lucas. Main impressions were the extraordinarily high standard of efficiency and excellent labour relations. There was, however, plenty of room here, as in the U.S., for greater use of mechanical aids. Young men should be encouraged, they concluded, to visit the States and learn of methods there at first hand. The team's report is expected to be published in between six and nine months' time.

NEWS IN BRIEF

The B.o.T. is setting up a small organisation to pave the way to establish if it should be necessary a Control of Factory and Storage Premises on the lines which operated during the war.

Equipment for the electrical installation at the new Nuffield United Services Officers' Club, Portsmouth, was supplied by British Insulated Callender's Cables Ltd.

We would like to point out that the trading code announced by eight manufacturers of heavy duty cooking apparatus, and reported in our July 19 issue, refers specifically to electrical apparatus and should not be attributed to similar gas or solid fuel appliances.

Questions in Parliament

Anglo-American Productivity

Arrangements were well advanced for some ten teams to pay visits to U.S. under the auspices of the Productivity Council, said Mr. Gaitskell in a written answer. The teams would cover such industries as machine tools, constructional steelwork and specialised subjects like inspection methods and production control.

Breadalbane H.-E. Project

The Secretary of State for Scotland said he had carefully read the report of the Amenity Committee concerning the Breadalbane project of the N. of Scotland H.-E. Board, together with the latter's observations, but did not think it proper to comment at this stage. If there were objections the report would be available for an inquiry, and if not, then it would be published as a White Paper which would accompany the scheme on its presentation to the House. Pressed to say whether the report was in favour or against the scheme, Mr. McNeil said that while the committee had made many recommendations, some of which were very good, it had accepted the scheme.

Possible Control on Some Goods

In the course of his statement on the country's financial and economic situation, Mr. Gaitskell told Parliament that the Central Price Regulation Committee had recently completed a special review of goods which have become decontrolled, and have recommended the re-imposition of control over a considerable range of goods. The list was a long one, he said, and consequently he did not intend to read the whole of it. Examples of goods included were, carpet sweepers, washing machines, cookers and refrigerators.

Copper Prices

The Minister of Supply gave manufacturers' list prices for typical sizes of copper tubes used in the engineering industry on July 1 in each of the years 1936, 1940, 1942, and 1945, in a written answer on Friday. He also gave the prices of electrolytic copper on those same dates. In 1936 it was £41 per ton and in each of the three succeeding years it remained at £62 per ton.

Electricity Supply

It was hoped that 1,100 MW of new capacity would be commissioned this year, and the rate of

commissioning was expected to increase to 1,400 MW by 1954, Mr. Noel-Baker stated in a written answer. He went on to say that the B.E.A., N. of Scotland H.-E. Board and Electrical Research Association were all experimenting with the use of wind for power, and the H.-E. Board was rapidly expanding the use of water power in Scotland. The B.E.A. was studying its use elsewhere also. Nevertheless, the majority of this country's electricity had to be supplied from thermal stations using coal.

H.E. Development in Wales

No detailed proposals for the hydro-electrical development of North Wales had yet been submitted to him by the B.E.A., said the Minister of Fuel and Power, last week, and, therefore, he was unable to say if or when legislation might be required. He was replying to Mr. Vosper who further asked if he would take into account views of the National Parks Committee and the Minister of Local Government and Planning before sanctioning legislation. Mr. Noel-Baker said he had discussed matters of general principle which the scheme involved with the B.E.A., and warned them of the likelihood of objections on the grounds of amenity.

Imports of Materials

The Lord Privy Seal gave the amounts of various materials imported during 1950 for which his department was responsible. They were as follows: 141,201 tons of aluminium, 100,835 tons of copper, 171,888 tons of lead, 141,918 tons of zinc and 235,491 tons of rubber. Although it was not possible to give reliable estimates of prices paid for imports of individual commodities, he did give percentage increase between average prices in 1950 and those in June this year. For aluminium this was 9%, for h.c. electrolytic copper 31%, for zinc 34%, for rubber 36% and for lead 50%.

Supply Regulations—More Questions

Further questions were put to Mr. Noel-Baker last week concerning the action which might be taken by domestic or industrial consumers to secure redress for damages caused by interruption or diminution of supplies. Replying, he said that the provisions of the Electricity Supply Regulations permitted a break in supplies in cases of emergency. The Boards were not therefore liable for damage since they were within their legal rights. He added that if there were any doubts on the legal aspects of the matter perhaps somebody could be advised to go to the courts. As to what constituted an emergency the Minister said the B.E.A. never cut power unless a breakdown of plant was imminent, which situation would be so much against the national interest as to constitute an emergency.

Power Cut Statistics

In a written answer on Friday Mr. Noel-Baker gave the dates and number of days on which power cuts occurred during April, May and June in the years 1949, 1950 and 1951. Summarised, these details were as follows: in those three months during 1949 load shedding took place on ten days, in 1950 on 37 days and this year on 65 days. He regretted he had no information readily available about the duration of those cuts, and in any case it varied from one district to another.

Radio and TV Sets—Safety Precautions

Asked about the need for revision of safety precautions concerning radio and television sets, Mr. Ede said he understood that a new British Standards specification for tv sets, which included revised safety precautions, was nearing completion. He added that the risk of fire and shock from electrical appliances was one of the matters being discussed by the inter-Departmental Committee on Accidents in the Home. Consultations would continue with manufacturers concerning safety precautions.

Rural Development

The development of electricity in agriculture was proceeding faster now than ever before. By March 1948 80,770 farms had been connected to the mains and that figure had increased to 99,365 by March this year, said Mr. Noel-Baker, in reply to questions last week. Mr. R. A. Butler asked whether in view of this progress the schemes in north Essex, turned down because they were apparently impossible at present, could be expedited. Mr. Butler was told that restrictions on total investment limited the number of connections which had been made, but connections since 1947 had been greater than before.

Sulphur from Power Stations

The Minister of Fuel and Power was asked whether he was consulting competent authorities other than those concerned with the generation of power about the recovery of sulphur from power stations. The questioner said he understood there was some prejudice among electrical engineers against having to deal with by-products and things of that kind. The Minister replied that scientific experts and various authorities were looking into the problem, and research was constantly going on, but so far no economic method had been found. Amplifying the latter point for another questioner he said a method had been discovered of obtaining sulphur compounds, but the capital costs would be £60 per ton and the price £20 a ton as against £13 for sulphur. It seemed, therefore, a highly unevonomic proposition at present.

Technical Education in B. Guiana

Classes for electricians and for technical students in electrical theory, and in welding, would be among subjects taught at the technical institute to be opened in British Guiana later this year, the Secretary of State for the Colonies told the House last week. He added that according to information available at present there would be nine full-time and several part-time teachers, and it was anticipated that over 600 students would undergo instruction for varying periods each week.

Technical Personnel Committee

In a written reply last Thursday, the Minister of Labour announced that it had been decided to reconstitute the Technical Personnel Committee which dealt with scientific and technical manpower

problems following the war. Lord Hankey will again be chairman of the committee which will have rather wider terms of reference. It will review the requirements for scientists and engineers at home, especially in the light of the defence programme and in relation to supply. It will also consider what more can be done to meet requirements overseas for such personnel.

V.H.F. Communications

Following the Postmaster-General's statement on v.h.f. broadcasting, reported last week, Mr. Orr-Ewing asked if more information could be given as to the discovery of a new method. This, it was stated, was not possible. Mr. Kerr then asked if the U.S. authorities had approached this country with a view to arranging a change in the existing system of amplitude modulation for marine communication to that of frequency modulation. Mr. Ness Edwards replied that the U.S. had approached him to reconsider its decision that amplitude modulation should be used for single-channel v.h.f. maritime radio services in the U.K. Discussions had not yet taken place, but it was proposed to support the case for amplitude modulation in any international discussions.

V.H.F. Radio Apparatus

In view of the fact that his Department had declared its policy on maritime v.h.f. radio services, and had induced European and Commonwealth countries to follow that policy, the Postmaster-General was asked whether he would give an assurance that the policy would not be revoked without ample notice to the trade. In a written answer, Mr. Ness Edwards stated that the fullest practicable notice would be given of any change influencing design of that apparatus.

Electric Supply News

Dereham

A proposed £40,000 scheme, creating a Norwich-Dereham-Salle ring, was referred to by Mr. R. E. Atkins, A.M.I.E.E., district manager at Norwich to the Eastern Electricity Board, in a talk to Dereham Rotary Club last week. The scheme, which would give Dereham five alternative sources of power, is to use o.h. lines, for underground cables were 80% more expensive, he said.

Halifax

The T.C. has received an explanation from the Yorkshire Electricity Board concerning the delay in supplying electricity to a certain district. The Board has stated that it has been awaiting authorisation in respect of capital allocation.

Holderness

The Rural District Council has decided to protest to the Yorkshire Electricity Board against the latter's decision not to supply Halsham and West Newton with electricity before the end of 1952.

Ireland

Another stage in the Erne hydro-electric scheme, sponsored by both the Northern and Southern Governments has been reached. The second of two artificial lakes was created by the flooding of a valley above a new dam between lower Lough Erne and the sea at Kathleen Falls, just over the border in Eire.

Malvern

In no circumstances would the Malvern Council agree to electricity being installed in Great Malvern in any way which necessitated the use of overhead cables, declared Councillor G. T. Baldwin, a member of the Malvern U.D.C., at a meeting of the Midlands Area Electricity Consultative Council last week. "In dealing with Malvern, the Midlands Electricity Board was dealing with a special case and they had failed to take into account local conditions," he said.

"If it comes to a question of choosing between this kind of service, and no service at all, we would rather have no service at all."

Another member suggested that the h.t. mains to Malvern housing estates should be underground, power then being taken from house to house by o.h. cable from the eaves. The Chairman of the Midlands Electricity Board, Ald. W. S. Lewis said he had no wish to run wires and poles all over the place, and suggested the difficulty at Malvern could be overcome by means of a system of central poles and eave to eave wiring. The cost of an 11-mile-long underground cable to reinforce the Malvern supply would be £178,000, and to spend this money at Malvern would mean that somebody else in the area would have to go short. However, he respected Malvern's point of view in the matter. Saying that if the o.h. cable project went through the amenity value of Malvern would be cut by at least 25%, Councillor Baldwin extended an invitation to Ald. Lewis to attend the next Malvern Council meeting and state his case. This invitation Ald. Lewis accepted.

LIGHTING SCHEMES

Ashby-de-la-Zouch.—U.D.C. to invite tenders for installation of main street lighting at Ashby.

Billingshurst (Sussex).—The Parish Council propose to borrow £1,000 for converting street lighting from gas to electricity.

Bournemouth.—Consent to a loan of £5,174 has been received for improved street lighting in Alma, Richmond Park and Hinton Roads, and Queen's Park Avenue.

Stockton-on-Tees.—The T.C. has received sanction to borrow £4,400 for electric street lighting on Roseworth estate.

Wellingborough (Northants).—The R.D.C. has approved plans for the conversion of street lighting from gas to electricity.

Company Activities

Dividend Limitation

The Chancellor of the Exchequer announced last Thursday that a Bill to impose a limit on the gross amount of dividend which may be distributed, other than fixed-rate dividends, will be introduced in the autumn. Limitation will be retrospective, and will operate for a three-year period. It will apply to all companies registered under the Companies' Act, and the dividends to be controlled will include any participating element in Preference dividends, cash bonuses and other distributions not made by way of repayment of capital. In the case of an existing company, the annual amount which may be distributed in dividends will be the average of dividends paid in the last two accounting periods before July 27, 1951, in which a final dividend had been declared. Companies who have paid no dividends, or only abnormally low ones, will be allowed to pay up to 5% of the ordinary paid up share capital, or £10,000. New companies will be limited to 7% of the capital. In exceptional circumstances, the Treasury may allow an increase in the amount of dividend.

Calcutta Tramways Ltd.

For 1950, the profit is £56,341 (*£49,037*) after all charges, including tax of £122,000 (*£120,000*). The final dividend is 3½%, making 6% tax free (*same*). The profit figure is arrived at after charging to renewal and replacement account £80,000 (*same*), reserve for improvements and extensions £60,000 (*£50,000*) and debenture interest of £30,693 (*£30,564*). The sum of £73,736 (*£66,270*) is carried forward. There has also been transferred to reserve for improvements and extensions a sum of £96,000, being taxation reserve no longer required. Details of a proposed agreement with the West Bengal Government are to be submitted at an extra-ordinary meeting on August 15.

George Cohen & Sons, Ltd.

For the year to March 31 last, the group profit after all charges, including tax, amounted to £342,229 compared with £129,369 for the previous twelve months, according to the preliminary report. The final dividend is increased by 3% to 15%, making 23% (*20%*).

R. and A. G. Crossland

Neville Industrial Securities announce that the demand for the Ordinary 1s. Crossland shares was many times in excess of the 800,000 available at 2s. 3d. a share, but in view of the Government's statement on the control of dividends, they have decided, in conjunction with the company and its brokers, not to proceed with the placing of the shares. Accordingly, all monies deposited with Nevill Industrial or the brokers will be refunded, or the applicants' cheques returned.

Dubilier Condenser Co. (1925)

Trading for the year to March 31 last was £214,750 as against £151,401 for the previous year; and the net profit was £70,421 (*£64,194*). Current assets are listed at £508,641 (*£399,853*) and current liabilities at £187,179 (*£130,138*).

Electrical Components Ltd.

The preliminary statement shows a group profit for the year to March 31 last of £53,711 (*£54,067*). The final dividend is 12½%, again making 20%, payable on September 14.

General Electric Co. Ltd.

The Ordinary dividend is again 10%, but the cash bonus is raised from 7½% to 12½% for the year ended March 31 last. The preliminary statement shows an aggregate group profit of £5,651,418 compared with £4,471,692 for 1949-50, before allowing U.K. and overseas taxation and the proportion attributable to minority shareholders. Consolidated net profit attributable to the holding company after U.K. and overseas taxation amounted to £1,978,039 (*£1,709,404*). U.K. taxation charged was £3,149,743 (*£2,378,017*). The net profit dealt with in the accounts of the holding company is £1,768,953 (*£1,498,680*). In addition, the sum of £403,234 (*£208,740*), being the net profit relating to previous years has been brought into the group profit and loss account, of which £325,051 (*£110,220*) has been dealt with in the accounts of the holding company.

A. H. Hunt, Ltd.

In view of the development of the business the directors propose to increase the authorised capital to £200,000 by creating 375,000 Ordinary 4s. shares and to raise up to £50,000 by offering certain of these new shares, in the first instance, to shareholders by way of rights. A meeting to consider the proposals is called for August 15.

Johnson, Matthey & Co.

It is announced that, following upon the Chancellor's White Paper on the control of dividends, the arrangements for the proposed new issue of Ordinary shares by way of rights to Ordinary shareholders and loan stockholders at 58s. a share are under review.

Siemens Brothers & Co.

The 450,000 Ordinary shares held by the Custodian of Enemy Property, to which we referred on June 7, are to be disposed of to Associated Electrical Industries Ltd., the Board of Trade announced on Monday. The shares, which represent about 15% of Siemens' Ordinary capital, were issued in 1929 to the German firm Siemens and Halske against the then equivalent value of that concern's shares to Siemens Bros. Ltd. Several companies, including Siemens themselves, made offers for the shares, we understand.

Dividends Declared

George Kent, Ltd.—Final dividend of 9½%, making 12½% (*10%*). Group profit, after taxation, £153,870 (*£186,537*).

Wellman Smith Owen Engineering Co.—Final Ordinary dividend of 10%, making 25% (*12½% plus bonus 5% tax free*).

Commercial Information

CONTRACTS OPEN

HOME

Aug. 3.—Belfast. Supply and erection of a 6-ton travelling lifting, semi-Goliath, manually operated gantry for handling circulating water screens, for Electricity Dept. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See July 5 issue.)

Aug. 3.—Stepney. Electrical installation to dwellings, wiring to be v.i.r. cables drawn into steel conduit, together with all necessary fittings, switches, etc. Applications by above date to Council's Architects, Sydney Clough Son and Partners, 39 Devonshire St., W.1. Deposit £2 2s. (See July 26 issue.)

Aug. 4.—Lanark T.C. Electrical work in erection of 16 houses at Kildare. R. T. Stewart, Town Clerk, Town Clerk's Office.

Aug. 4.—Reigate. Supply and installation of two sludge ejectors with electricity driven air compressors, starters, etc. George Sanderson. Borough Engineer and Surveyor, Town Hall.

Aug. 4.—Swansea T.C. Electrical installation in 148 houses at West Cross. Applications by above date to Borough Architect, The Guildhall. Deposit £2. (See July 19 issue.)

Aug. 7.—Ely R.D.C. Supply and erection of two centrifugal pumps, complete with electric motors and automatic switchgear. Council's Consulting Engineers, Silcock and Simpson, 10 Park Row, Leeds. Deposit £5.

Aug. 8.—Bradford. Electrical installation, lighting and heating at Thackley infants' school. City Architect, Town Hall.

Aug. 8.—Manchester. Electrical installation at Poundswick county primary school, Wythenshawe. City Architect, Town Hall. Deposit £1 1s. (See July 19 issue.)

Aug. 8.—Neston. (Ches) U.D.C. General and stage lighting at the Institute, Hinderton Rd. Engineer and Surveyor, Town Hall. Deposit £1 1s.

Aug. 11.—Colne T.C. Erection complete of 49 140 W sodium street lamps with concrete columns on trunk road A.56. Borough Engineer, Town Hall.

Aug. 13.—Southport T.C. Installation of class A sodium lighting along five roads and class B filament lighting along 30 roads. Lighting Engineer, 117-123a Shakespeare Street.

Aug. 13.—Stepney. Installation of lighting, heating and power points in 77 dwellings at Vallance Rd. Borough Engineer and Surveyor, Municipal Offices, Duval St., E.1. (See July 12 issue.)

Aug. 15.—Cumnock and Holmhead T.C. Supply and erection of lamps, lanterns, controls, wiring, etc., for 44 lighting points on trunk road A.75. Burgh Surveyor, Town Hall, Cumnock.

Aug. 17.—Belfast. Supply and erection at Victoria power station of 3,300 V 150 MVA air or oil break switchgear, 400 V, 15 MVA air break switchgear, 400 V fuse gear and accessories. Also three centrifugal circulating water pumps, each capable of 23,000 g.p.m. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. for each specification. (See June 14 issue.)

Aug. 17.—Newcastle-on-Tyne T.C. Supply of electricity supply and overhead line equipment. Frank S. Taylor, General Manager, Transport and Electricity Undertaking, Head Office, Manors, Newcastle 1.

Aug. 18.—Bath. Supply of electrical and other fittings for street lighting. City Engineer, Guildhall, Deposit £1 1s.

Aug. 18.—Warsop (Notts) U.D.C. Wiring for electricity of 147 houses in Fitzherbert St. area. Applications to R. J. Smith, Clerk to Council, Town Hall. Deposit £2 2s.

Aug. 20.—Surrey. Provision and erection of 51 concrete columns, 140 W sodium lamps and ancillary equipment along Kingston By-Pass (A.3). County Engineer, County Hall, Kingston.

Aug. 21.—Sunderland T.C. Electrical installation in 12 shops and flats on Pennywell estate. Borough Architect, Grange House, Stockton Rd., Sunderland. Deposit £2 2s.

Aug. 22.—Keighley T.C. Supply of 14 5-ft fluorescent fittings, 14 sets of control gear and 28 warm white lamps for Central Library and Hall. Tenders to Town Clerk, Town Hall.

Aug. 22.—Tettenhall U.D.C. Supply and erection of street lighting equipment on trunk road A.41. Installation involves tubular steel columns and full "cut-off" type lanterns and sodium lamps. J. W. Mason, Engineer and Surveyor, Council Offices. Deposit £2 2s.

Aug. 24.—Fife. Electrical installation in each of following schools: Carleton primary, Glenrothes, Camdean primary, Rosyth, Valley primary, Kirkcaldy, Blacklaw primary, Dunfermline, Comrie junior secondary, Oakley, Surveyors, Messrs. James Gentles and Son, Central Chambers, High St. Kirkcaldy.

Aug. 27.—Manchester. Installation of fire alarm system at "Newholme," West Didsbury City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Aug. 27.—Wolverhampton T.C. Installation of sodium mercury and fluorescent lighting, including supply and erection of steel columns, lanterns, auxiliary control and time switches. Borough Engineer, Town Hall. Deposit £2 2s. (Advertised in this issue.)

Aug. 28.—Bradford. Electrical installation at Reception Block in Squire Lane. City Architect, Town Hall.

Aug. 29.—Kidwelly T.C. Supply and erection of 3 centrifugal sewage pumping units rated at 50 g.p.m. and 2 rated at 25 g.p.m All to be electrically operated and automatically controlled. Engineers, Messrs. A. P. I. Cotterall and Son, 54 Victoria St., Westminster, S.W.1. Deposit £2 2s.

Aug. 31.—Belfast. Supply and erection of 33 kV and l.v. transformers of ratings up to 7,500 kVA. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See July 19 issue.)

Sept. 14.—Belfast. Supply and erection of ash handling plant of high pressure sluicing type capable of removing 45-50 tons per hour, for Victoria power station. Merz and McLellan, Carliol House, Newcastle-on-Tyne.

Deposit £5 5s. (Advertised in this issue.)

No date stated.—N. of Scotland H.E. Board. Supply and erection of approx. 25 miles of 11 kV and 26 miles of low voltage wood pole overhead lines, and about 1½ miles of cabling at Banchory Devenick and Old Machar, Aberdeenshire. Merz and McLellan, 39 Northumberland St., Edinburgh. Deposit £1 1s. (See July 12 issue.)

No date stated. — Adwick-le-Street (Yorks) U.D.C. Electrical installation in 146 houses on the Woodlands estate, 70 on Carcroft estate and 16 other dwellings on same estate. Particulars from W. S. Ellis, Engineer and Surveyor, Council Offices. Deposit £2 2s.

No date stated.—Derbyshire. Conversion from steam to electric drive steam and condense services in new laundry machinery at the Grove, Shardlow. County Architect, County Hall, St. Mary's Gate, Derby. Deposit £2 2s.

No date stated. — Hexham R.D.C. Firms not already on councils list are invited to tender for supply of electrical goods required in housing schemes. Written application to G. Nicholson, Clerk, Prospect House, Hexham.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Aug. 7. — India. Directorate General of Supplies and Disposals, Shahjahan Rd., New Delhi, requires carriage and wagon wheel lathe to take standard 5½ ft gauge wheels of latest design with electrically operated built-in wheel lift. Electric motor control gear and full electrical equipment for 400/440 V, 3-phase, 50 c/s, a.c. supply. B.o.T. (Ref. CRE (IB) 66564/51).*

Aug. 8.—Belgium. State Railways invite tenders for 400 electrical relay circuits for speed control indicators. Societe Nationale des Chemins de Fer Belges, Direction de Materiel et des Achats, 17 rue de Louvain, Bruxelles.

Aug. 20.—U.S.A. U.N. at New York require six transcription turntables with direct drive at centre and two speeds, 33⅓ and 78·26 r.p.m., when operated from 60-cycle source. Motor to operate from 110 V supply. B.o.T. (CRE (IB) 66330/51).*

Aug. 21.—India. Tenders invited for seven sets of v.h.f. direction finder equipment complete with accessories and spares. Directorate General of Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref. CRE (IB) 66572/51)*.

Aug. 22.—India. Directorate General of Supplies and Disposals, New Delhi, require ten 3½ ton mobile cranes. B.o.T. (Ref. CRE (IB) 66855/51)*.

Sept. 18.—Egypt. Supply of a total of 111 kilometres of electric cable to various specifications for the Cairo Electricity and Gas Administration. B.o.T. (Ref. CRE (IB) 66767/51)*.

Sept. 18. — Egypt. Director General, Cairo Electricity and Gas Administration requires supply (into stores) of 111 km of 2- and 3-core power cable P.I.L.C. double armoured, working voltage 200 and 380 V. Documents may be obtained from Chief Inspecting Engineer, Egyptian Govt., 41 Tothill St., S.W.1. (Advertised in this issue.)

Nov. 6.—New Zealand. State Hydro-Electric Dept., Wellington, invites tenders for manufacture and supply of 11 kV substation of duplicate busbar indoor metal clad draw-out type with accessories. Deposit £100.

CONTRACTS PLACED

Barnard R.D.C. Installation of electric lighting in 250 washhouses on council estates, Swaledale Radio and Electrical Co.

Brighton. Provision and installation of electrically driven centrifugal pumps at waterworks. Harland Engineering Co., Ltd., £3,811.

Islington. Rewiring and improvement of lighting at North branch library, London Electricity Board, £2,476.

Manchester. Installation of electric lift at Devonshire Royal Hospital for Regional Board, J. Royle, £3,836.

Newcastle-on-Tyne T.C. Installation of electricity in houses previously served by gas, Bernard Barrie, £5,295.

Newcastle-on-Tyne T.C. Provision of street lighting on new housing estates, Revo Electric Co., Ltd., £2,034.

Newcastle (Staffs.). Electrical installation at Hempstalls Farm county primary school, J. Bagguley and Son, £2,213.

Worthing T.C. Rewiring of houses on South Farm estate, Messrs. Rice and Son Ltd., London, £1,655.

Your Queries — Answered

"Tem-con" thermostats, makers of? A.I. — P.A.M. Ltd., Merrow, Guildford, Surrey. (20958)

"Speedivac" vacuum pump, makers of? T.—W. Edwards and Co. (London) Ltd., Worsley Bridge Rd., S.E.26. (20961)

"Auto Perc" coffee percolator, makers of? C.H.—Falk, Stadelmann and Co., Ltd., 91 Farringdon Road, E.C.1. (20973)

Tailor's goose-type iron, 12-14 lbs, makers of? H.J.W.—Dowsing Co. (Electrical Manufacturers) Ltd., Kangley Bridge Road, Lower Sydenham, S.E.; Bellow Machine Co., Ltd., Bellow House, Grafton Street, Leeds 7. (20984)

"Torex" toaster, makers of? A.B.—These were made by Salmic and Co., Ltd., but this firm went out of business in 1947. (20996)

"Wagner" motors, spares for? J.P.T.—Refrigerator Components Ltd., 77 Great Peter Street, Westminster, S.W.1. (21009)

Reconditioning of fluorescent tubes? W.G.T.—E. J. Dawes, Ltd., Erimus Works, Stockton Street, Middlesbrough. (21016)

Aquarium heaters and equipment, makers of? W.F.S.—Singleton Bros. (Instruments) Ltd., 53 Victoria Street, S.W.1; Controlled Equipments Ltd., 22 Highgate High Street, N.6. (21028)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Philips. 669,328. Class 6. Welding rods for use in the construction of electric lamps. Philips Electrical Ltd., Century House, Shaftesbury Avenue, W.C.2.

Froude. 688,372. Class 9. Dynamometers. Heenan and Froude, Ltd., Shrub Hill Rd., Worcester.

Vocatron. 694,292. Class 9. Intercommunication apparatus. Vocaline Co. of America Inc., Coulter St., Old Saybrook, Connecticut.

TRADE NOTES

Norwegian Tariff. From today, Aug. 2, the Norwegian Government has put into effect amendments to the Customs tariff negotiated at the Torquay conference. Under this, the duty on voltmeters, galvanometers and insulation testers is reduced from 20% *ad valorem* to 15%; for steam turbines and rotary convertors the new rate is 10% (as against 20%), and for electromechanical hand tools with built-in motor, 15% (compared with 20%). Duty on switches of 200 amps or over, and transformers, is 17½%, and for rectifiers other than mercury arc, 20%, the latter being 15%.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	234 0 0	£220 0 0
LEAD, good soft pig (foreign)	180 0 0	136 0 0
" " " "English" quality	181 10 0	—
TIN (99·99·75%) (Cash)	822½-827½	—
" (3 months)	810 - 815	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	140 0 0
ARMOURING:		—
Galv. Steel Wire (0·104 in.)	50 0 0	—
Mild Steel Tape (0·04 in.)	26 10 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Fieldway Engineers (Nuneaton) Ltd., 43 Newdegate St., Nuneaton, Warwick. To obtain from Thomas Warrington the whole rights in the U.K. in a certain invention, and to carry on business of consulting, superintending, civil, constructional, motor and elec. engrs., etc. Cap.: £2,000. Permt. Dirs.: T. Warrington and Gladys Warrington, W. V. Tipping and Hazel M. Ward.

Lee, Beesley and Co. (Birmingham) Ltd., 10 Regent St., Coventry. Elec. engrs. and gen. elec. installation contractors, etc. Cap.: £1,000. Dirs.: G. S. Nott and H. Beesley.

Mannock Rayner Ltd., 61 Carey St., W.C.2. Mnfrs. of and dlrs. in elec. motors, pumps, dynamos, magnetos, etc. Cap.: £300. Dirs.: J. Hickin, Mrs. G. B. Baker, and R. H. Heir.

Martin and Brown (Electrical Appliances) Ltd., 3 Dyers Bldgs., Holborn, E.C.1. Cap.: £1,000, Dirs.: To be apptd. by subs. Subs.: N. E. Picking and D. Israel.

R. and Y. Engineers, Ltd., 56 Westcourt Rd., Worthing. Scientific, mech., elec. and model engrs., etc. Cap.: £1,000. Dirs.: Miss J. N. Red and E. P. Yallop.

W. H. Taylor (Derby) Ltd., 8 Bold Lane, Derby. Elec., radio, lighting, telephone, mech., automobile, agricultural, marine and gen. engrs., etc. Cap.: £6,000. Dirs.: W. H. Taylor and R. D. Taylor.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

O. P. Docherty and Co., Ltd. Resolution for voluntary winding-up passed at meeting on July 16. Creditors are asked to send particulars to the liquidator, John Forsyth, C.A., 4 Frederick St., Sunderland.

Sherborne Electrical Co. Ltd. Extraordinary resolution for voluntary winding-up passed at meeting held on July 18. Edward Balfour Bate, Carlton Chambers, 25 Baldwin St., Bristol, was appointed liquidator.

Warrington Electric Cables Ltd. Resolution for voluntary winding up was passed at meeting on July 24. Cecil Douglas Irving, Incorp. Acc., 7 Rumford St., Liverpool, has been appointed liquidator, to whom creditors are asked to send particulars on or before Aug. 31.

Elkrom Electrical Development Ltd. Meeting of creditors is to take place at 7 Park Row, Nottingham, on Aug. 15 at 3.30 p.m.

Neon Tube-Lights (Finsbury) Ltd. Meetings of members and creditors are to be held at 487 Green Lanes, Palmers Green, N.13, on Sept. 12 at 10 and 10.30 a.m. respectively to receive liquidator's report.

Partnership Dissolved

Banstead (Surrey). Tadensz Legge and Elsie Legge trading as "Hibberds Radio," electricians, at 18 Buff Parade, Banstead, and 11 The Parade, Burgh Heath. Partnership dissolved as from July 6. Debts received and paid by Elsie Legge, who will continue the business under the same name.

Winding-up Order

London. The Eagle Refrigeration Co. Ltd., Grays Inn Rd., W.C.1. Date of winding-up order, July 23.

BANKRUPTCY ACTS

Order on Application for Discharge

Salford. Arthur Smith and James Smith, trading as "J. and A. Smith," electrical contractors at 550 Bolton Rd., Pendlebury. Discharge suspended for six months and that they be discharged as from Dec. 25. Grounds named: refusal of absolute order of discharge.

Appointment of Trustee

Kendal. Stephen Edmondson, trading as "E and B Radio," electrical dealer and contractor at Main St., Milnthorpe. Trustee is Leslie Harry Shipton, C.A., 31 Lloyd St., Manchester 2.

Intended Dividends

London. Robert T. H. Brimfield, electrical contractor trading as "Richfield Electrical Components" at 73-78 High Holborn, W.C.1. Last day for receiving proofs was July 31.

Stockton-on-Tees. Jack Henderson, electrician, trading at 82A Galgate, Barnard Castle. Last day for receiving proofs, Aug. 8. Trustee is Robert F. Howe, Official Receiver, 4 Bridge Rd., Stockton-on-Tees.

BUSINESS PROSPECTS

HOME

Arbroath. Dean of Guild Court approved erection of primary school at Hayshead. Estimated cost is £120,000.

Ashby - de - la - Zouch U.D.C. Thirty houses are to be built at Oakthorpe and a number also on Moira Rd. site.

Ayr. Approval received for building of primary school in Dalmilling district and a secondary school in the Drongan area.

Berwick T.C. Erection of 20 houses. Borough Surveyor, Municipal Buildings.

Bingley (Yorks) U.D.C. All trades and separate trades for erection of 10 houses at Cullingworth and 10 at Wilsden. J. S. Lattin, Surveyor and Architect, Town Hall.

Blandford (Dorset) R.D.C. Plans approved for an estate at Blandford St. Mary.

Bury T.C. Tenders expected to be invited shortly for erection of 82 houses on Topping Fold site.

Chester. Erection of 106 houses at Blacon estate. City Engineer and Surveyor, Municipal Offices, 43 Northgate Street.

Clowne R.D.C. Construction of a total of 48 houses on three sites. Arnold Senior, Clerk of the Council, Council Offices, Clowne, near Chesterfield.

Consett (Dur.) U.D.C. Construction of 31 houses on Moorside No. 3 site. Architect is J. J. Eltringham, Derwent St., Blackhill.

Croydon. Approval granted to Ductworth Ltd. for factory extensions; to Funnell, Dyson and Gregory for building a new factory; and to J. H. Greenwood, agent, 20 Jermyn St., S.W.1, for reconstruction of factory and public house in Albert Road.

Doncaster. E.C. is to obtain a loan for £50,000 to build Hawthorne primary school at Cantley.

Durham. Council seeking sanction to borrow £9,732 for electrical installation to 336 houses at Sherborn Rd. and Hatfield View.

Exeter. Approval received for building of 7 shops and 10 flats on Countess Wear estate.

Fulham. Plans approved for construction of a block of 40 flats on Edith Villas site. Estimated cost is £79,750 and architects are Cachemaille-Day and Partners.

Gillingham (Kent) T.C. Erection of 33 flats in three blocks. Borough Engineer and Surveyor, Municipal Buildings.

Higham Ferrers U.D.C. George Street is to be developed at an estimated cost of £53,400, including erection of 36 houses.

Houghton-le-Spring. The G.P.O. is to build a telephone exchange in Pit Road.

Ilkeston (Derby). Cost of old people's home at Kirk Hallam has been estimated at £30,469.

Islington. Preliminary plans approved for additions to Holloway county secondary school. Estimated cost, £370,755.

Jarrow-on-Tyne T.C. It is proposed to build three-storey blocks of flats and maisonettes near Ormonde St. First 48 dwellings of this scheme are estimated to cost £55,744.

Lambeth. Preliminary plans approved for erection of county secondary school on Strand School playing field in Upper Tulse Hill. Estimated cost is £651,562.

Lancashire. It is proposed to erect the Bacup Thorn school at cost of £20,075, and Chorley South county secondary modern school at £187,020.

Liverpool. Standard Motor Co., Ltd., Coventry propose to build a 500,000 sq ft factory at Kirkby. Also Council has been recommended to re-invite tenders for erection of 272 dwellings at Kirkby.

Manchester. Approval granted for erection of 183 more flats at Woodhouse Park, Wythenshawe. Estimated cost £254,000.

Meriden (War) R.D.C. Tenders to be invited for erection of 34 houses at Fillongley Lane.

Motherwell. Dean of Guild Court has approved industrial building schemes for Lanarkshire Steel Co. Ltd. (£6,000), and Coalvilles Ltd. (£21,500).

Oakham (Rutland) R.D.C. Construction of 16 houses at Manton and 12 at Edithweston. Council's Architect, H. W. Kelham, 14 All Saints Place, Stamford, Lincs.

Padiham (Lancs). St. John's Rd. estate scheme has now been approved. It comprises 45 houses and 69 bungalows.

Paisley. Dean of Guild Court approved plans for spinning mill by United Thread Mills, Ltd. Cost is £500,000.

St. Pancras. Preliminary plans approved for additions to Parliament Hill county secondary school at estimated cost of £395,870.

Shipley U.D.C. Tenders to be invited shortly for electric rewiring of public abattoir.

Southport. Liverpool Regional Hospital Board has approved conversion of Hesketh Park Hydro into convalescent home.

Spilsby R.D.C. Toynton Hall is to be converted into offices and a council chamber at cost of £8,500.

Stourbridge T.C. Erection of 152 dwellings on Wollaston Farm estate. Also erection of 6 shops, 4 maisonettes and two flats on Norton estate. Application in both instances to G. N. Maynard, Borough Engineer and Surveyor, the Council House.

OVERSEAS

Ecuador. Messrs. Arturo Anibal Freire Freire, P.O. Box 2,110 Quito, wish to obtain agencies for (among other items) radios and radiogramophones.

South Africa. G. S. Rogers (Pty.) Ltd., P.O. Box 3667, Johannesburg, would like to obtain the representation of a U.K. manufacturer of condensers or capacitors. This firm has branches in Cape Town and Durban and an affiliated company in Salisbury and N'dola (S. and N. Rhodesia resp.).

Peru. Commercial Arequipa S.A., Santa Catalina 115, (Casilla 607) Arequipa, would like to represent U.K. manufacturers of domestic electrical appliances (pressure cookers, small electric stoves etc.) and radio receivers in southern Peru.

MEETINGS TO NOTE

SATURDAY, AUGUST 4

TRAVELLING EXHIBITION arrives at third stage of tour, Birmingham, remaining open until August 25.

WEDNESDAY, AUGUST 8

BRITISH ASSOCIATION 1951 Meeting in Edinburgh, and continues until August 15.

TUESDAY, AUGUST 14

A.S.E.E. (S.W. London Branch).—"Carbon Brushes for Electrical Machines." C. T. Lawrence. St. Georges Hall, St. Georges Rd., Wimbledon. 8.15 p.m.

WEDNESDAY, AUGUST 15

FESTIVAL SHIP "CAMPANIA". Arrives Belfast and stays until Sept. 1

For multi-storey buildings

If you have a problem concerning the distribution of electricity supplies in large multi-storey buildings or small blocks of flats, Henley's can provide the solution :—

The HENLEY Rising Main System for large buildings; HENLEY Metalclad Distribution Boxes for two or three-storey dwellings.

Tybald's Close, London, W.C.1. A Henley Rising Main Installation by The London Electricity Board.

or 2 or 3-storey flats

Henley metalclad distribution box for small blocks of flats as installed by the Midlands Electricity Board for the **Birmingham Corporation Housing Dept.**

Please write for Literature Ref. 46 which gives complete details.

HENLEY

ELECTRICAL DISTRIBUTION EQUIPMENT

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51-53 HATTON GARDEN, LONDON, E.C.1

No. 2 Sub-standard Instruments

The Weston Series of Portable sub-standard instruments covers a wide range of applications, including precision measurements in the laboratory . . . meter standardisation . . . transfer standards between D C and A C circuits . . . field measurements, acceptance tests, etc. They are available as Wattmeters, Voltmeters, Ammeters and Milliammeters in a variety of ranges and all embody 6" scales, magnetic shielding and spring-loaded jewels. Full details of these instruments, also Weston switchboard, panel, first grade and laboratory standard instruments will gladly be supplied on request.

WESTON
Electrical Measuring Instruments

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (4 lines). Grams: Sanwest, Enfield

Branches: Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton & Brighton

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF BELFAST

ASH HANDLING PLANT, VICTORIA POWER STATION

TENDERS are invited for the supply, delivery, and erection of ash handling plant of the high pressure sluicing type, capable of removing 40/50 tons of ash per hour from furnace hoppers and delivering to ash storage bunkers.

Form of tender (No. N.1062), conditions, and specification, in quadruplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas (cheques to be made payable to the Belfast Corporation Electricity Department) which will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set; this sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Ash Handling Plant, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, September 14, 1951.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
July 26, 1951. (L 550)

EGYPTIAN GOVERNMENT

TENDERS are called for by the Director-General, Cairo Electricity and Gas Administration, for the supply and delivery into Stores, Cairo, of 111 km. of 2- and 3-core POWER CABLE P.I.L.C. double armoured, working voltage 200 volts and 380 volts.

Tenders should be submitted to: The Director-General, Cairo Electricity and Gas Administration, 53 Fouad El Awal Street, Cairo, Egypt, not later than noon on September 18, 1951.

Copies of the necessary conditions of tender, specification, etc., can be obtained on application to the Chief Inspecting Engineer, Egyptian Government, 41 Tothill Street, London, S.W.1, against remittance of £2 1s. per set, which sum must be prepaid and is not returnable. Copies of these documents are also available for scrutiny at the above address. Cheques must be endorsed permitting transfer to an Egyptian Government account.

Reference No. 35/Elect. and Gas 3/2/193 must be quoted in all correspondence. (L 516)

COUNTY BOROUGH OF WOLVERHAMPTON

Street Lighting Improvement Scheme

GROUP "A" ROADS

TENDERS are invited for the installation of SODIUM MERCURY AND FLUORESCENT LIGHTING, including the supply and erection of steel columns, lanterns, auxiliary control and time switches.

Plans, specification, bill of quantities and form of tender may be obtained on application to the Borough Engineer, Town Hall, Wolverhampton, on payment of a deposit of 2 gns., which will be returned on receipt of a bona fide tender and all documents.

Tenders, enclosed in a plain sealed envelope and endorsed "Street Lighting," must be delivered to the undersigned not later than 12 noon on Monday, August 27, 1951.

The Council do not bind themselves to accept the lowest or any tender.

J. BROCK ALLON,
Town Clerk.

Town Hall, Wolverhampton.
July 25, 1951. (L 523)

CITY OF MANCHESTER

THE WELFARE SERVICES COMMITTEE invite tenders for the installation of a FIRE ALARM SYSTEM at "Newholme," Nell Lane, West Didsbury, Manchester.

Specification and drawings may be obtained at the office of the City Architect, Town Hall, upon payment of one guinea, which sum will be returned upon receipt of a bona fide tender. All cheques and postal orders are to be made payable to the order of "The Corporation of Manchester" and crossed.

Sealed tenders, enclosed in the official envelope, to be delivered at the Town Hall not later than 10 a.m. on Monday, August 27, 1951.

The Corporation do not bind themselves to accept the lowest or any tender.

PHILIP B. DINGLE,
Town Clerk.

Town Hall, Manchester 2.
July, 1951. (L 552)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:

JUNIOR ENGINEER—Luton Generating Station.

Salary in accordance with Clause 35 of the N.J.B. Schedule A, Class "E," Grade 14, £375-£387 per annum.

Applicants should preferably have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent. Previous experience with Rotary Converting Plant and/or in a Generating Station will be an advantage.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than August 10, 1951. Envelopes should be endorsed "Junior Engineer, Luton."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (L 461)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Glasgow Sub-Area

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited to fill a position as Engineering Draughtsman.

Applicants should have experience in civil, building and structural engineering work and be able to prepare working drawings for the erection of sub-station buildings and for alterations and additions to existing buildings, also to take out quantity details for contract specifications.

The salary offered will be in accordance with the National Joint Board Agreement, viz. within Schedule "D," Grade 6, £375 to £500 per annum according to qualifications and experience.

The successful candidate will be required to pass a medical examination and to contribute to the British Electricity Authority and Area Boards' Superannuation Scheme.

Application forms can be obtained from the undersigned and must be returned, endorsed "Engineering Draughtsman," not later than fourteen days from the appearance of this advertisement.

JOHN CAIRNS,
Secretary.

Glasgow Sub-Area,
75 Waterloo Street,
Glasgow C.2. (L 559)

LONDON ELECTRICITY BOARD

Demonstrators

APPLICATIONS are invited for positions as Demonstrator (Female) at Hackney, E.5, Holloway, N.7, Hoxton, N.1, Stoke Newington, N.16, and Barking, Essex.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate, including electrical housecraft, and have experience in conducting demonstrations at Service Centres and in general Service Centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the Service Centre and on consumers' premises.

The posts are graded within the permanent agreement of the National Joint Council (Administrative and Clerical Grades) as Grade 1, i.e., £310 to £390 per annum, plus the appropriate London Area Allowance.

Application forms obtainable from Establishments Officer, 46 New Broad Street, London E.C.2. Please enclose addressed foolscap envelope and quote Ref. EST/V/1284/9/T. on all correspondence. (L 557)

CITY OF MANCHESTER

City Architect's Department

APPLICATIONS are invited for the appointment of an ELECTRICAL ENGINEERING ASSISTANT on the permanent staff, A.P.T. Grade 3, salary £500 to £545 per annum. Candidates must be capable of preparing schemes for electric lighting and power installations in all types of municipal buildings, and should have passed the intermediate examination of the Institution of Electrical Engineers.

The salary and conditions of service will be in accordance with the National Joint Council's Scheme of Service Conditions.

Forms of application may be obtained from and returned to Leonard C. Howitt, B.Arch., F.R.I.B.A., City Architect, Town Hall, Manchester 2, by the first post on September 11th, 1951, endorsed for the appropriate appointment.

Canvassing is prohibited.

PHILIP B. DINGLE,
Town Clerk.

Town Hall, Manchester 2.
August, 1951. (L 551)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of BOILER HOUSE SHIFT CHARGE ENGINEER at Longford Generating Station, Coventry.

Applicants should have had a sound technical training and be experienced in all branches of engineering associated with the operation of Chain Grate Stokers and have considerable knowledge of combustion and boiler operation. Graduate membership of the Institution of Mechanical or Electrical Engineers will be an advantage.

The salary will be in accordance with Grade 9, Class "G," of the N.J.B. Schedule at present £571-£597 per annum.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, East Midlands Division, Barker Gate, Nottingham, and should be returned to the undersigned not later than August 14, 1951.

L. F. JEFFREY,
Divisional Controller.

July 17, 1951. (L 458)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIO..3 are invited for two vacancies of BOILER HOUSE SHIFT CHARGE ENGINEER at Nechells 'A' Generating Station, Birmingham. Salary will be in accordance with Class "G," Grade 9 of the National Joint Board Agreement, commencing at £571 per annum, but the station will ultimately be reduced to Class "F."

Applicants should possess the Higher National Certificate in Electrical or Mechanical Engineering or an equivalent qualification, and experience in the operation of pulverised fuel fired boilers will be considered an advantage. Opportunities for promotion will present themselves within the Birmingham group of stations to the successful applicant, if suitably qualified.

Conditions of service will be in accordance with the N.J.B. Agreement and superannuation under terms approved by the British Electricity Authority.

Forms of application may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than August 18, 1951.

F. W. LAWTON,
Divisional Controller.
(L 554)

CROWN AGENTS FOR THE COLONIES

INSPECTOR OF WORKS (Temporary) (Distribution Section) required by the Government of Sierra Leone for the Electricity Branch, Public Works Department, for one tour of 18 to 24 months in the first instance. Salary according to age, £808 or £875 a year including expatriation pay and temporary allowance. Gratuity of £15 for each period of three months service on satisfactory completion of contract. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates not over 40 years of age, must have served an apprenticeship in the distribution section of an electricity undertaking; have had extensive experience in the overhaul and repair of power transformers, h.t. and l.t. switchgear, etc., have had some years of practical experience in the jointing of underground cables up to 11 kV and be able to instruct others in correct cable jointing procedure. Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.26554B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (L 521)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointments :—

JUNIOR ENGINEERS,
Cliff Quay Generating Station, Ipswich.

Salary in accordance with Clause 35 of the N.J.B. Schedule "A," Class "J," Grade 16, £413 to Grade 14, £478 per annum.

Preference will be given to applicants who have had previous experience in a Generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

The appointments will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than August 18, 1951. Envelopes should be endorsed "Junior Engineers—Cliff Quay."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (L 540)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the appointment of JUNIOR ENGINEER (Boiler House) at the Freemen's Meadow Generating Station, Leicester.

Candidates should possess technical qualifications, and previous experience in a Generating Station will be an advantage.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, Class "H," Grade 13, £458 to £476 per annum.

Applications should be made on forms which may be obtained from the Establishments Officer, East Midlands Divisional Headquarters, Barker Gate, Nottingham, and should be returned not later than August 14, 1951.

L. F. JEFFREY,
Divisional Controller.

July 17, 1951. (L 509)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

FIRST ASSISTANT STATION CHEMIST—Peterborough Generating Station.

Salary will be in accordance with the N.J.B. Agreement, Schedule A, Class "E," Grade 9 (£519-£531 per annum). Reconstruction will extend the station classification to Class "F" later this year.

Applicants should have scientific education equivalent to Intermediate B.Sc. and possess practical experience in the sampling analysis of fuel, oil and water.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application may be obtained from the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to whom completed forms should be sent to arrive not later than August 11, 1951. Envelopes should be endorsed "First Assistant Station Chemist—Peterborough."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (L 462)

NORTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 1 Sub-Area

SENIOR DEMONSTRATOR
Central District

The duties will include demonstrations, service calls and advice on housecraft problems, contact with local bodies and associations, and co-operation with the Sub-Area Senior Housecraft Adviser in the training of trainee demonstrators. Applicants should possess a recognised certificate in cookery or institutional management, and possession of the E.A.W. Diploma will be an advantage.

The salary for the post will be in accordance with Grade 2 of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry Salary Grades, i.e. £390 per annum rising by annual increments of £20, subject to satisfactory and competent service, to a maximum of £450 per annum.

SECOND ASSISTANT
DISTRICT COMMERCIAL ENGINEER
South West District

The duties will include assistance to the District Commercial Engineer in all aspects of sales development, e.g. advice on electricity utilisation, tariffs, conditions of supply, etc., appliance sales, demonstrations, exhibitions and publicity.

The salary will be in accordance with the National Joint Board Revised Agreement, Class "E," Grade 7, i.e. £579 to £594 to £609 per annum.

If an applicant has specialised knowledge of any particular aspect of development (domestic, commercial, industrial or agricultural) details should be given.

The possession of the Ordinary or Higher National Certificate in Electrical Engineering will be an advantage.

Applications for the above posts, stating age, education and training, experience, present post and salary, should be received by the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall Extension, Manchester 2, P.O. Box No. 493, not later than Saturday, August 11, 1951.

No. 3 Sub-Area

PRINCIPAL ASSISTANT
Sub-Area Secretary's Department

Applications are invited for the appointment of principal assistant in the Sub-Area Secretary's Department at the No. 3 Sub-Area Headquarters, Union Street, Oldham, at a salary in accordance with Grade 8 of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry Salary Grades, i.e. £795 per annum, rising by annual increments of £35, subject to satisfactory and competent service, to a maximum of £900 per annum.

Candidates should have had extensive experience in a responsible administrative capacity and must possess sound organising ability. Knowledge of conditions of service for employees of the electricity supply industry, purchasing routine, wayleave procedure, stores, insurance and canteen and welfare organisation, is essential.

GENERAL ASSISTANT DISTRICT ENGINEER
Stalybridge District

Applications are invited for the appointment of general assistant district engineer in the 3C (Stalybridge) District of the No. 3 Sub-Area.

The salary for the post will be in accordance with the National Joint Board Revised Agreement, Class "G," Grade 11, i.e. £506 to £517 to £528 per annum.

The engineer appointed will be required to give general assistance to the District Engineer and his senior staff with relation to the following:—

Operation and maintenance of high and low voltage networks (overhead and underground);
Operation and maintenance of sub-stations;
Supervision of constructional work;
The keeping of technical records;
General maintenance of supply and such other matters as may be necessary.

The successful candidate will be required to undertake standby duty.

EMERGENCY SERVICE ELECTRICIANS
Rochdale District

Applications are invited for the appointment of emergency service electricians in the Consumers' Department in the Rochdale District of the No. 3 Sub-Area.

The terms and conditions will be in accordance with those laid down by the National Joint Industrial Council for the Electricity Supply Industry, the present rate of pay being 36.5d. per hour, plus 2d. per hour for shift duties (£7 1s. 2d. for a 44-hour 5-day week), operating according to an alternate shift rota.

Applicants should have extensive experience as service electricians in regard to fault localisation and repair on electrical installations and apparatus.

Applications for the above posts, stating age, experience and qualifications, present post and salary, should be received by E. Binns, Esq., M.I.Mech.E., A.M.I.E.E., Sub-Area Manager, The North Western Electricity Board, No. 3 Sub-Area Headquarters, Union Street, Oldham, not later than Saturday, August 11, 1951.

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No. 4 Sub-Area

GENERAL ASSISTANT
DISTRICT COMMERCIAL ENGINEER
Preston District

The duties will be to assist generally in all activities connected with the utilisation of electricity for domestic, commercial, agricultural and industrial purposes.

The salary will be in accordance with the National Joint Board Revised Agreement, Class "F," Grade 13, i.e. £405 to £414 to £423 per annum.

Applications, stating age, qualifications, experience, present post and salary, should be received by the Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, not later than Saturday, August 11, 1951.

No. 6 (Lakeland) Sub-Area

THIRD ASSISTANT ENGINEER

Applications are invited for the appointment of third assistant engineer in the Building and Civil Engineering Section at the No. 6 (Lakeland) Sub-Area Headquarters, Castle Green, Kendal.

Applicants should have had experience as clerk of works with a thorough knowledge of all sections of the building trade, be capable of setting out, giving levels, measuring up, keeping all necessary site records and rendering reports.

The duties will include those of clerk of works on buildings now in course of erection and the appointed person will also be subsequently responsible for the maintenance and repair of the Board's property in No. 6 Sub-Area.

The salary for the post will be in accordance with the National Joint Board Revised Agreement, Class "H," Grade 10, i.e. £571 to £584 to £597 per annum.

Applications, stating age, education and experience, present post and salary, should be received by the Sub-Area Manager, No. 6 (Lakeland) Sub-Area, Castle Green, Kendal, not later than Saturday, August 11, 1951. (L 532)

SOUTH EASTERN ELECTRICITY BOARD

Woking District
DISTRICT MANAGER

A VACANCY will shortly exist for a district manager at Woking, in the Surrey Sub-Area. The district has an area of 70 square miles and supplies 26,000 consumers, the imported maximum demand being 21,680 kilowatts. The provisional salary will be between £1,100 and £1,200 per annum. Superannuation will be arranged. The person appointed will be required to act as deputy to the present district manager until his retirement in January, 1953. Applicants must have considerable experience of district organisation and preference will be given to corporate members of the I.E.E.

Application forms obtainable from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, South Eastern Electricity Board, Rough Rew, Horsham Road, Dorking, Surrey, to be returned by August 15, 1951.

SECOND ASSISTANT ENGINEER
(Planning and Development Section)
Kent Sub-Area Headquarters, Rochester

Salary of £786 per annum to £822 per annum under the N.J.B. Schedule, Class "K," Grade 7. Superannuation will be arranged. Applicants should have had experience in the design, layout and operation of urban and rural distribution systems, including overhead and underground networks at voltages up to 33 kW. A knowledge of network calculations and experience in the preparation of distribution schemes is desirable. Corporate Membership of the I.E.E. or equivalent qualification will be an advantage.

Applications, giving two referees, must reach H. F. Knell, J.P., M.I.E.E., Kent Manager, South Eastern Electricity Board, 178/184 High Street, Rochester, by August 15, 1951.

A. L. BURNELL,
Secretary.

July, 1951. (L 536)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of ELECTRICAL MAINTENANCE ASSISTANT at the Clarence Dock Power Station, Liverpool. Salary £515 to £537 per annum, being Class "K," Grade 13 of the N.J.B. schedule.

Applicants must have sound practical experience in the electrical maintenance of power station plant. Possession of technical qualifications would be an advantage. The appointment will be superannuable under the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary, Clarke Gardens, Woolton, Liverpool, and be returned to him not later than Wednesday, August 15, 1951.

A. R. COOPER,
Divisional Controller.
(L 527)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following positions:

STATION CHIEF CLERK—Brunswick Wharf Generating Station.

Candidates should have experience and knowledge of fuel data and statistics, technical statistics and operation returns of a generating station; N.J.I.C., N.J.C. and N.J.B. agreements; stores control and general administration in the clerical duties of a generating station.

Salary and conditions of service will be in accordance with the N.J.C. Permanent Agreement, Grade 4, i.e., £540 to £600 per annum, inclusive of London weighting.

STORES SUPERVISOR—Brunswick Wharf Generating Station.

Candidates should have practical experience in the classification of stores and spares and in the ordering and maintenance of stocks.

Salary and conditions of service will be in accordance with the N.J.C. Permanent Agreement, Grade 2, i.e., £420 to £480 per annum, inclusive of London weighting.

Both the foregoing posts are superannuable.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1. (L 522)

ELECTRICITY SUPPLY COMMISSION

Southern Rhodesia

APPLICATIONS are invited for the following vacant posts on the permanent staff of the Electrical Department:—

The general conditions of service include a contributory pension scheme, Medical Aid Society, Holiday Fund; 36 to 45 days full-pay leave per annum, paid sick leave, initial sea and rail fares subject to agreement to remain in the service of the Electricity Supply Commission for a minimum of three years. In addition to the basic salaries, at present a Cost of Living Allowance of approximately 35% applies. Also, children and dependant allowances, where applicable. Appointment subject to medical examination and three months' probationary period.

1. TRANSMISSION AND DISTRIBUTION SECTION.

(a) SENIOR TECHNICAL ASSISTANT.—Applicants must be A.M.I.E.E., between ages 35 and 45, and with extensive experience in design and field construction, wood pole, steel pole and fabricated structure, pin and suspension insulator, A.C.S.R. and copper lines, also design and construction out-door substations from 11kV pole-mounting, up to 264 kV, 100 M.V.A., capacity. Salary scale £829 10s. by £31 10s. to £955 10s. per annum.

(b) TECHNICAL ASSISTANT, GRADE I.—Applicants must be A.M.I.E.E., between the ages of 30 and 40, and with experience in design and field construction of L.T. up to 11 kV distribution lines and substations. Salary scale £693 by £31 10s. to £787 10s. per annum.

(c) TECHNICAL ASSISTANT (JUNIOR).—Applicants should have B.Sc. or equivalent, Graduate M.I.E.E., and Student Apprenticeship training, including Drawing Office design work—under 30 years and single men preferred. Salary scale £430 by £40 to £510 *E* £570 by £40 to £690 per annum. Commencing salary according to qualifications

2. INSTALLATIONS SECTION.

TECHNICAL ASSISTANT, GRADE I.—Applicants must be A.M.I.E.E., between the ages 30 and 40, and with experience in operation and maintenance of indoor and outdoor suostations from 11 kV up to 132 kV, with O.L.T.C., remote control and auto-reclosing switchgear. Salary scale £693 by £31 10s. to £787 10s. per annum.

3. CONTRACTS SECTION.

TECHNICAL ASSISTANT (JUNIOR).—Applicants should have B.Sc. or equivalent, Graduate M.I.E.E. and Student Apprenticeship training with, if possible, some experience in field testing and research. Work will entail earth testing on transmission lines, lightning research, transformer inspections and technical statistics. Applicants must be under 30, and single men preferred. Salary scale £430 by £40 to £150, *E* £570 by £40 to £690 per annum. Commencing salary according to qualifications.

4. LINESMEN, GRADE I AND GRADE II.

Grade I.—£472 10s. by £31 10s. to £567.

Grade II.—£420 by £30 to £480.

A caravan or camping equipment is supplied, and applicants must clearly understand that they will be expected to camp out the whole time, for which an allowance of 4s. per diem, single and 5s. per diem married, will be paid.

Grade I Linesmen should have experience in suspension, insulator and pin-insulator work with wood and steel poles and fabricated towers

Grade II Linesmen should have experience of pin-insulator lines up to 11,000 volts.

Applications, giving age, educational and technical training details and qualifications, subsequent experience in chronological order, nationality, marital state with number and age of dependants, and enclosing copies of testimonials (which will not be returned), should be addressed to the Secretary, Electricity Supply Commission, P.O. Box 377, Salisbury, Southern Rhodesia, so as to arrive not later than August 15, 1951. (L 448)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the following positions at the Stuart Street Generating Station, Bradford, Manchester 11.

No. 509. POWER STATION SUPERINTENDENT.

The salary range will be £1,144 to £1,198 per annum in accordance with Grade 1, Class "H."

Candidates should have a good technical education and considerable practical experience in the operation, maintenance and administration of a large generating station; experience with pulverised fuel-fired boilers will be an advantage.

Corporate membership of the Institution of Mechanical Engineers and/or the Institution of Electrical Engineers, or an equivalent qualification will be an advantage.

No. 510. MAINTENANCE ENGINEER (ELECTRICAL).

The salary range will be £751 to £783 per annum in accordance with Grade 6, Class "H."

Candidates should have a wide knowledge of power station electrical equipment and practical experience of E.H.T. switchgear and protective gear.

Corporate membership of the Institution of Electrical Engineers or an equivalent qualification will be an advantage.

Applications are also invited for the following vacancies in the Technical Department.

No. 504. GENERAL ASSISTANT ENGINEER to be based at Preston.

The successful applicant will be required to assist in the testing and commissioning of primary equipment, associated protective gear; control and indicating circuits, also to carry out routine maintenance and fault investigation on such gear.

Candidates should be familiar with protective schemes and relays, and a knowledge of switchgear is desirable.

No. 505. GENERAL ASSISTANT ENGINEER in the Meter Section at Offerton, near Stockport.

Candidates should preferably have had experience in the calibration and testing of precision polyphase meters and indicating instruments.

Candidates for vacancies 504 and 505 should preferably possess the Higher National Certificate in Electrical Engineering or its equivalent, and the salaries for these positions will be within the range £437 to £622 per annum in accordance with Grade 8, Class "AX"/"DX."

No. 506. JUNIOR ENGINEER in the Meter Section at Offerton, near Stockport.

Candidates should preferably have had experience in the calibration and testing of precision polyphase meters and indicating instruments. Possession of the National Certificate in Electrical Engineering or its equivalent is desirable.

The salary will be within the range £375 to £552 per annum in accordance with Grade 9, Class "AX"/"DX."

All these positions will be superannuable and the salaries and conditions will be in accordance with the N.J.B. Agreement.

Applications, quoting vacancy number, stating age, qualifications, present position and giving full details of education and experience, should be received by the Divisional Secretary, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than August 18, 1951. (L 536)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

DRAUGHTSMEN

APPLICATIONS are invited for positions as Draughtsmen at the Divisional Headquarters, Barker Gate, Nottingham, from persons with experience in one or more of the following branches of work in connection with the construction of Generating Stations.

(a) Electrical Engineering Draughtsman with experience in the design and layout of extra high voltage outdoor sub-stations and overhead transmission lines above 33 kV.

(b) Civil Engineering Draughtsman with experience in reinforced concrete structures and foundations for heavy duty electrical and mechanical equipment associated with the construction of large generating stations.

The salary will be in accordance with Grade 4 (£600 to £700 p.a.) or 5 (£500 to £600 p.a.) of Schedule "D" of the N.J.B. Agreement, according to qualifications and experience, and superannuation will be under terms approved by the British Electricity Authority.

Applications must be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and should be returned not later than August 24, 1951.

L. F. JEFFREY,
Divisional Controller.

July 20, 1951. (L 508)

CIVIL SERVICE COMMISSION

PROFESSIONAL ENGINEERS IN GOVERNMENT DEPARTMENTS. The Civil Service Commissioners announce an Open Competition to be held during 1951 for permanent appointments in many departments of the Civil Service for a wider variety of engineering duties. Applications will be accepted at any time but not later than December 31, 1951, and selected candidates will be interviewed as soon as possible after the receipt of their application forms. Candidates are advised to apply as early as possible.

Age limits. Candidates must be under 35 on November 30, 1951, with extension for regular service in H.M. Forces and for established Civil Service. For appointments in the Post Office they must be 21 or over, in the Ministry of Supply, 23, and in all other departments 25 or over on that date.

Minimum qualifications vary for different posts. Generally a university degree in engineering or corporate membership of the Institutions of Mechanical Engineers, Electrical Engineers or Civil Engineers, or passes in or exemption from Sections A and B of the corresponding associate membership examinations, or evidence of exceptionally high professional attainment are required. For certain posts, corporate membership of the Institute of Fuel by examination or the Institution of Chemical Engineers, or graduate membership of the Institution of Chemical Engineers, or associate fellowship of the Royal Aeronautical Society or an honours degree in physics will be accepted instead.

The salary on appointment will be fixed according to age. The salary for men aged 26 in London is £500, rising by annual increments of £25 to £750. Salaries for women and for posts outside London are lower. There are prospects of promotion to higher grades on scales for men in London of £750-£1,000, £1,050-£1,270 and above.

These rates are at present under review.

Further particulars and application forms from Secretary, Civil Service Commission, Trinidad House, Old Burlington Street, London W.1, quoting No. 885/51. (L 518)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

SECOND ASSISTANT ENGINEER (Efficiency and Testing) Cliff Quay Generating Station

Salary in accordance with the National Joint Board Agreement, Schedule A, Class "J," Grade 9, (£646-£674 per annum), but will be subject to negotiation.

Applicants should possess the Higher National Certificate in Mechanical and/or Electrical Engineering or other equivalent qualifications and have had previous experience in a large generating station.

The successful applicant will be required to assist in the efficient and economical operation of the Generation Plant, the preparation of statistics and the keeping of technical records.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than August 18, 1951. Envelopes should be endorsed "Second Assistant Engineer (Efficiency and Testing)—Cliff Quay."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (L 541)

A SENIOR EXECUTIVE is required to act as technical engineer and to manage the works of a company manufacturing paper cables abroad. Applicants must have first-class qualifications and experience to meet the responsibilities of this progressive position. Advertiser is not a member of the C.M.A.—Box No. 8057, Electrical Times. (L 407)

A.M.I.E.E. (or B.Sc. or A.M.I.Mech.E. with good electrical experience) wanted by British Co. in Kampala, Uganda. Requirements are sound commercial experience sales, tendering, technical correspondence and general handling of engineering agencies, with particular emphasis on knowledge of heavy switchgear. Passages paid, pension scheme and home leave.—Write Box "JY/144," c/o 95 Bishopsgate, E.C.2. (L 517)

APPLICATIONS are invited for the post of WORKING ELECTRICIAN to cover the electrical maintenance of contractors' plant and vehicles used in the construction of a roadway in Saudi Arabia. The equipment includes: vehicle electrical systems, various Diesel-driven alternators up to 25 kVA., refrigeration plant, electric pumps and general distribution systems of single-phase supply as applicable to a mobile camp. Caravan accommodation and food are provided free. Salary £60 per month, at present free of tax.—Box No. 9035, Electrical Times. (L 545)

APPLICATIONS are invited from young men having an engineering degree, for the design of power transformers. Previous experience desirable, but not essential. Location Stafford.—Please write, stating age, qualifications and experience, quoting Ref. 225F to Central Personnel Services, English Electric Co., Ltd., 24/30 Gillingham Street, London S.W.1. (L 534)

ASSISTANT CASHIER required by Electrical Wholesale Distributors. The appointment offers a salary of £350 per annum and is superannuated.—Details of age and experience to Box No. 9025, Electrical Times. (L 512)

CAPABLE DESIGNER required for our branch works engaged in design and development of standard and special fractional h.p. motors of various types—a.c., d.c. and universal. Age: 30/35, preferably with experience of production, to act as assistant to Manager. 5-day week. Pension scheme.—Applications, in writing, stating age, experience and salary required, to Personnel Department, George Kent Ltd., Biscot Road, Luton, Beds. (L 524)

COMPANY establishing engineering works in Worthing and district requires experienced WORKS MANAGER for its fractional horse-power motor department. Progressive position for experienced man in this field of electrical engineering.—Write in strict confidence, giving experience, salary required, and when available, to Box No. 9021, Electrical Times. (L 510)

DESIGN ENGINEER required by successful old-established company in the North of England, engaged particularly in the manufacture of heavy duty d.c. switchgear. He should have scientific and commercial qualifications as well as practical experience, originality and initiative. He would have unlimited opportunity for developing his ability at a good salary, rising without limit according to his performance. To the right man the future prospects are bright.—Box No. 6079, Electrical Times. (K 805)

DESIGNER-DRAUGHTSMEN, preferably with Higher National Certificate, University Degree or similar qualifications and with 2-4 years' experience are required for work on mechanical and radio engineering and also on F.H.P. motors, a.c. and d.c.—Applications, giving age and record should be sent to the Staff Manager (Ref. GBLC/714), Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex. (L 530)

DRAUGHTSMEN with experience of switchgear and/or rectifier design required by Hackbridge and Hewittic Electric Co., Ltd., Walton-on-Thames. Pension scheme, five-day week.—Write, giving past experience, technical education and salary required, to Chief Mechanical Engineer. (L 549)

DRAUGHTSMEN, with experience on all sizes of power transformers, required by company in S.W. London. Pension scheme in operation and five-day week.—State full details, past experience, technical education and salary required.—Box No. 9039, Electrical Times. (L 547)

ELECTRICAL AND MECHANICAL ENGINEER required by tin mining company in Bolivia with knowledge of hydro-electric plants, milling and mining machinery. Age not over 25 years. Must be physically fit for work up to 16,000 feet. Good salary and excellent prospects to suitable man.—Write, stating full particulars, qualifications and experience, to Box E.T. 228 at 191 Gresham House, E.C.2. (L 520)

ELECTRICAL DRAUGHTSMAN, used to electrical net work and schematic diagrams. Sub-station layouts, factory layouts. Preparation of drawings for specifications of installation work. Five-day week. Pleasant conditions.—Apply, Tube Investment (Group Services) Ltd., Rocky Lane, Aston, Birmingham 6. (L 514)

ELECTRICAL ENGINEER required, age 35 to 40. Must have high technical qualifications and be a Full Member of the Institution of Electrical Engineers. Applicants should have had at least ten years' experience in manufacturing and on the test bed, of motors, starters and switchgear.—Apply in the first instance to the Chief Engineer, The Bowater Paper Corporation Ltd., Northfleet, Kent, stating age and salary required. (L 529)

ELECTRICAL ENGINEERS required as estimators and measurers in substantial well-established electrical contracting firm in Glasgow. Essential to have served apprenticeship in first-class firm. Preference given to person with recognised qualification. Superannuation and good prospects.—Box No. 9037, Electrical Times. (L 546)

ELECTRO-THERMAL ENGINEERS on the outskirts of London, require man between 28-35 years, with sound commercial knowledge, capable of assimulating technicalities, with knowledge of French and German. Good salary, pension scheme and excellent prospects for advancement.—Apply Box No. 9029, Electrical Times. (L 525)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

FOREMAN, thoroughly experienced electrical installation and cable work, required for good situation with large London firm, engineers and contractors.—Write experience and age, Box No. 9041, Electrical Times. (L 560)

MALES required as testers on electrical measuring instruments. Experience desired but not essential. Good opportunities for young men with National Certificate or equivalent.—Write for interview, stating age and previous experience, Sangamo Weston Ltd., Cambridge Road, Enfield, Middlesex. (L 553)

MUNICIPAL MUTUAL INSURANCE LTD. has a vacancy for an ELECTRICAL ENGINEER SURVEYOR in Exeter. Post is permanent and pensionable to satisfactory candidate who should be 25-35 years of age, have served an apprenticeship in Electrical Engineering and have sound practical and theoretical knowledge. Technical qualifications: Higher National Certificate or equivalent.—Apply, in own handwriting, marking envelope "Application Electrical Engineer Surveyor," and "Private and Confidential," to Chief Engineer, 22 Old Queen St., Westminster, S.W.1. (L 528)

OLD-ESTABLISHED Lampshade Manufacturers require REPRESENTATIVE with car for London, Home Counties and adjoining areas. Must have knowledge of the trade. Present connection Electrical Wholesale, Retail and Electricity Boards an advantage. Basic salary £400, plus expenses and commission.—Box No. 9023, Electrical Times. (L 511)

SENIOR DESIGNER-DEVELOPMENT ENGINEER required by leading manufacturer of domestic and light industrial electro-mechanical control devices in West London. Only men of proved experience and success in most modern practice need apply. First class opportunity for advancement.—Fullest particulars of qualifications, career to date and salary required in confidence, to Box No. 9031, Electrical Times. (L 533)

SENIOR SWITCHGEAR DESIGNER required with experience of indoor and outdoor Oil-break Equipment, 33 kV upwards. Applicants will be required to take responsibility for designs up to the production stage. The position offers good prospects to the right man. Minimum qualifications Graduate or Corporate Membership of the I.E.E. House available to married man. Superannuation scheme. Modern factory.—Applications, giving full details of experience and technical education, to the Personnel Manager, South Wales Switchgear, Ltd., Blackwood, Mon. (L 463)

THE Brush-Bagnall Traction Co. Ltd. invite applications from DESIGNER-DRAUGHTSMEN and DRAUGHTSMEN for work on Control Gear for Diesel Electric Locomotives. Previous traction and/or industrial control gear experience is essential. The posts offer excellent prospects and good salaries will be paid to men with the requisite experience.—Reply, giving details of age, experience, qualifications, etc., to The General Manager, Brush-Bagnall Traction Co. Ltd., Loughborough, Leics. (L 544)

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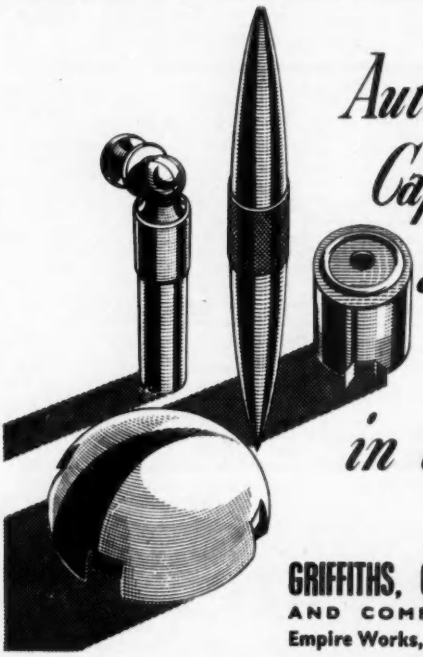

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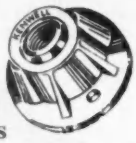

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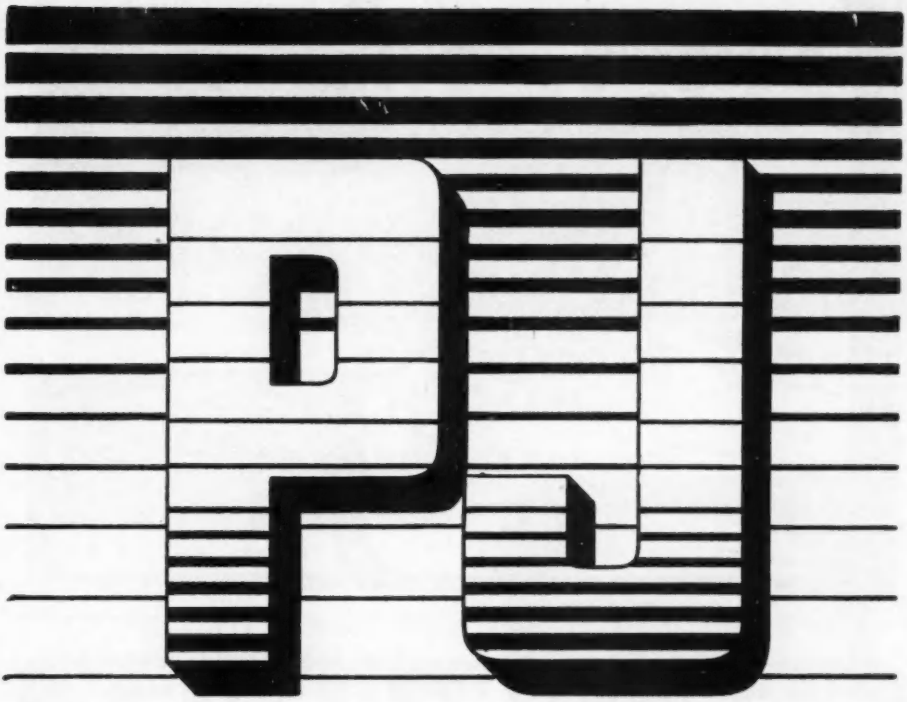

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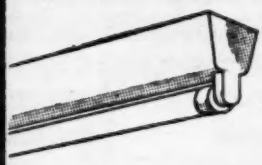

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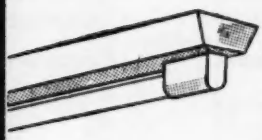

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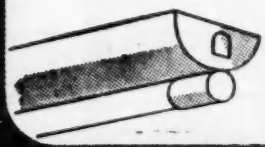

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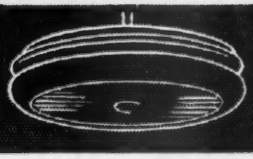

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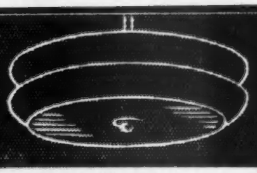

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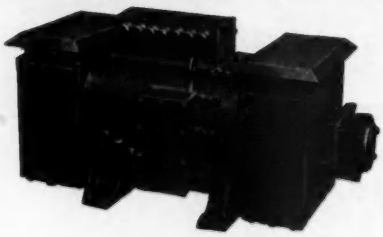

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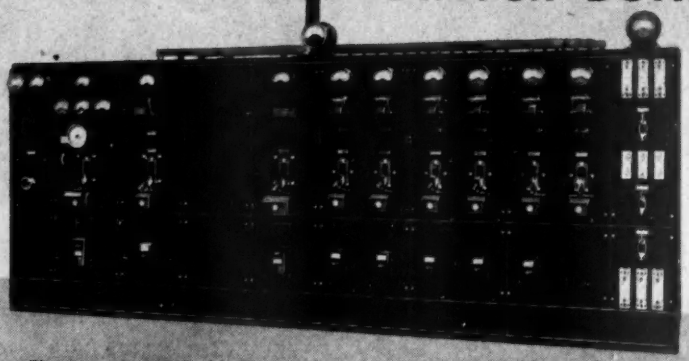

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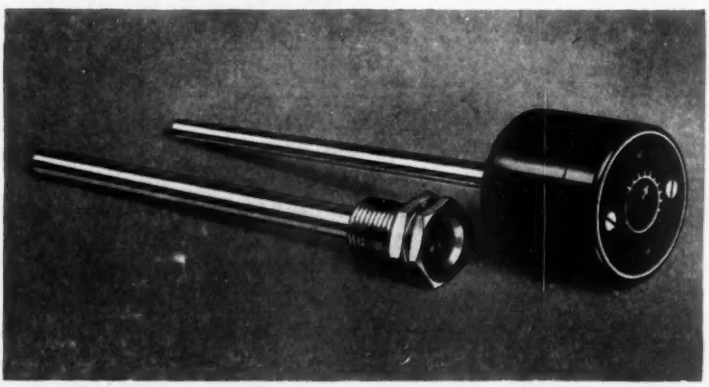

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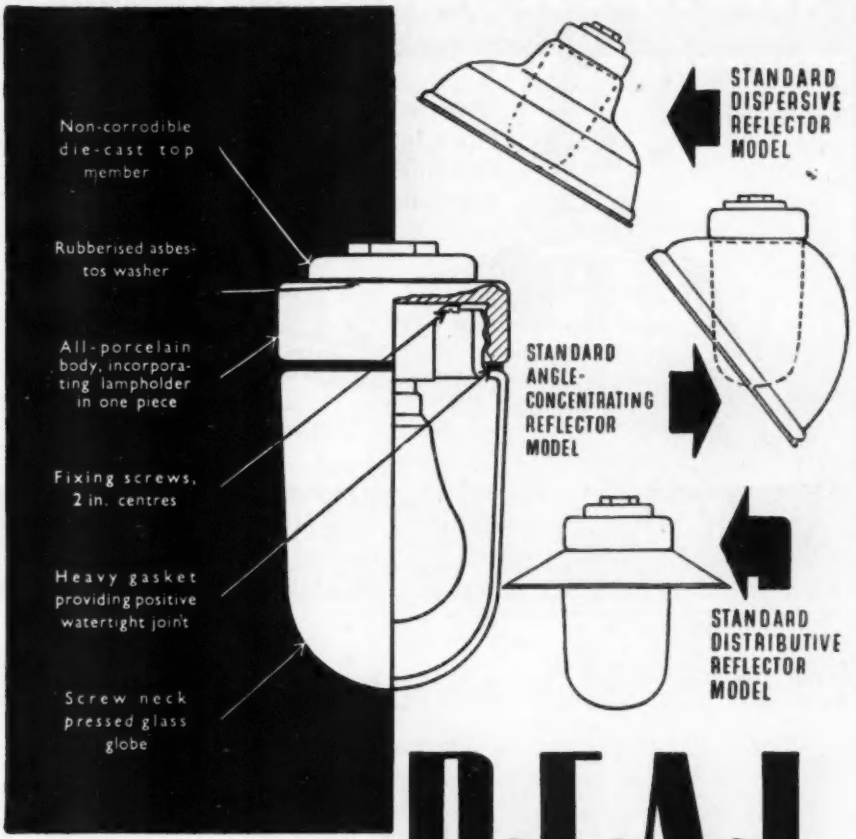
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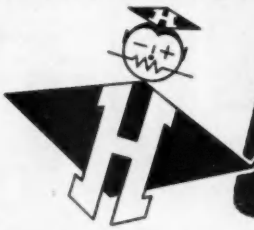

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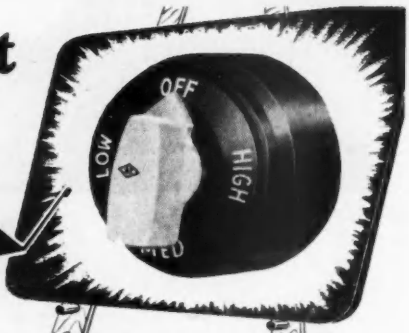

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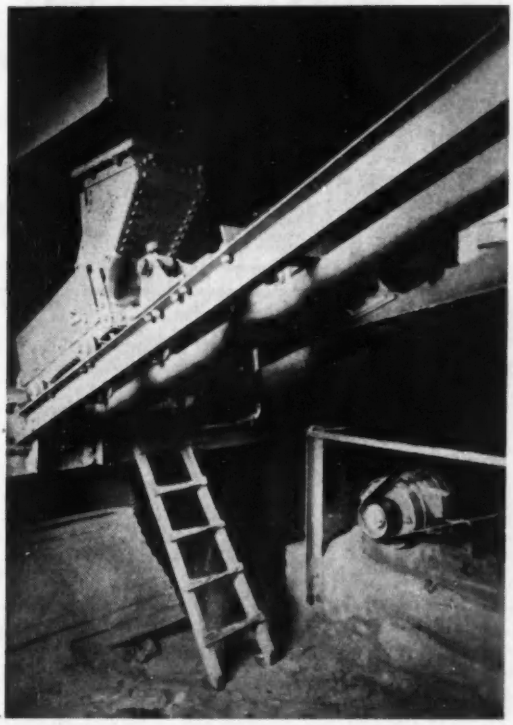

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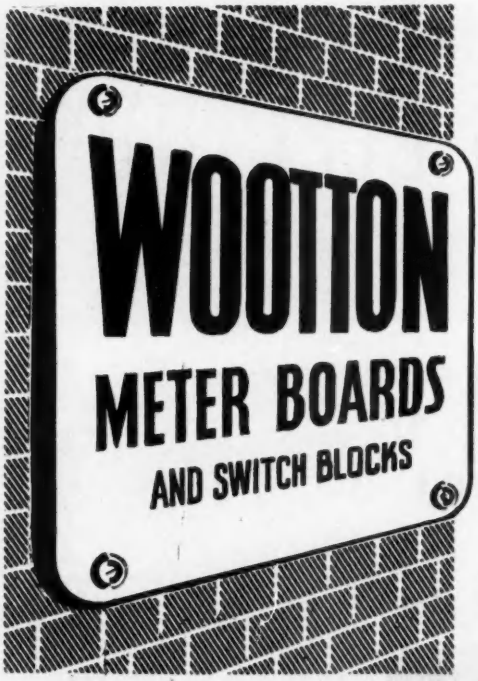

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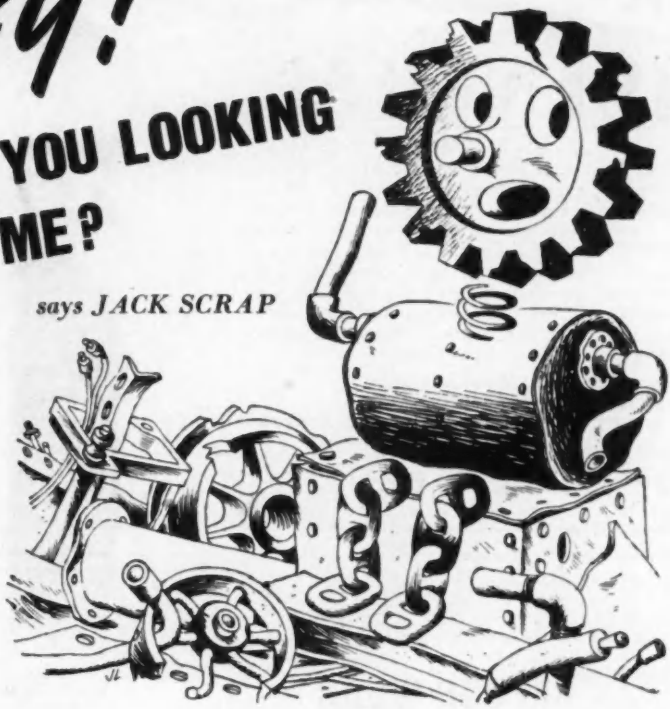

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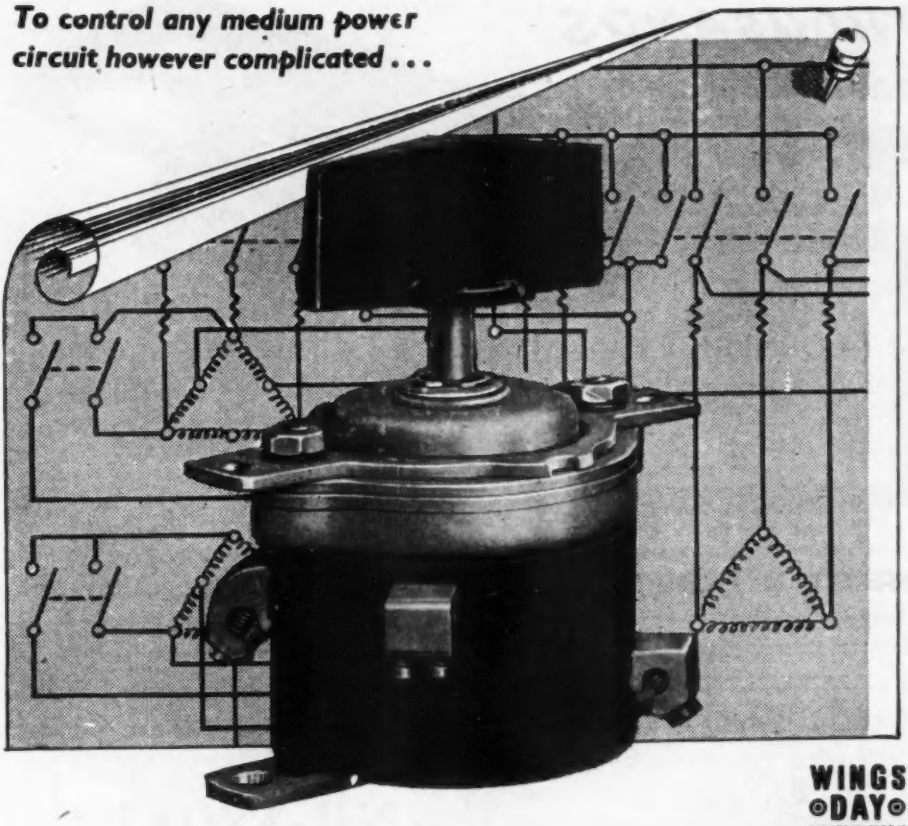

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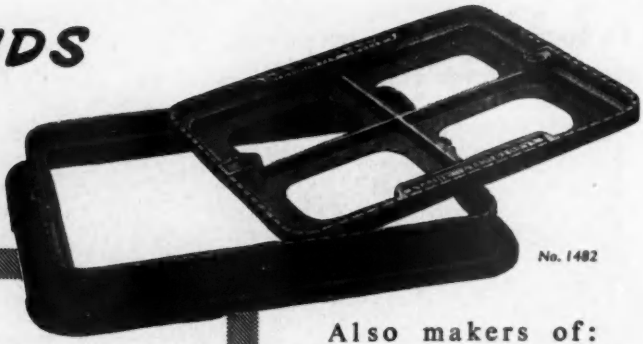

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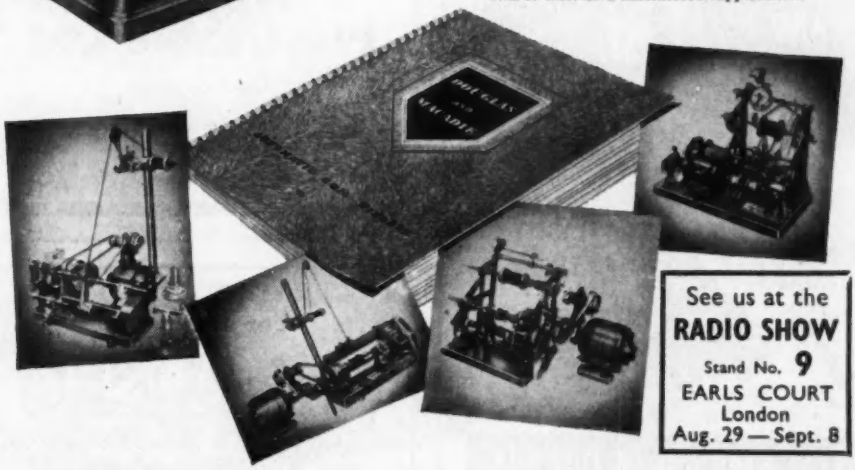

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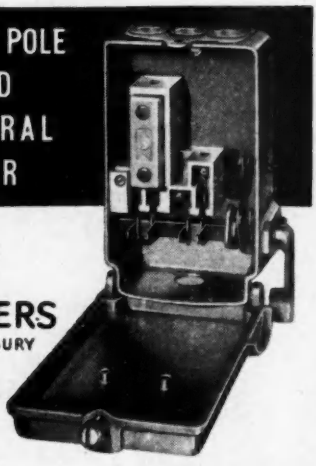

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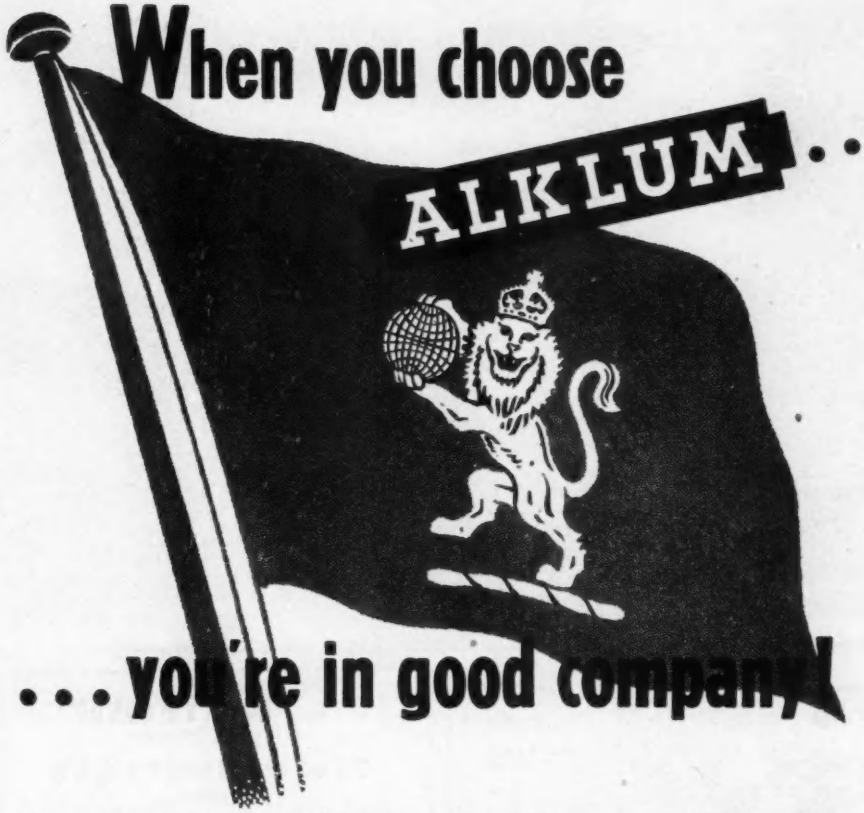

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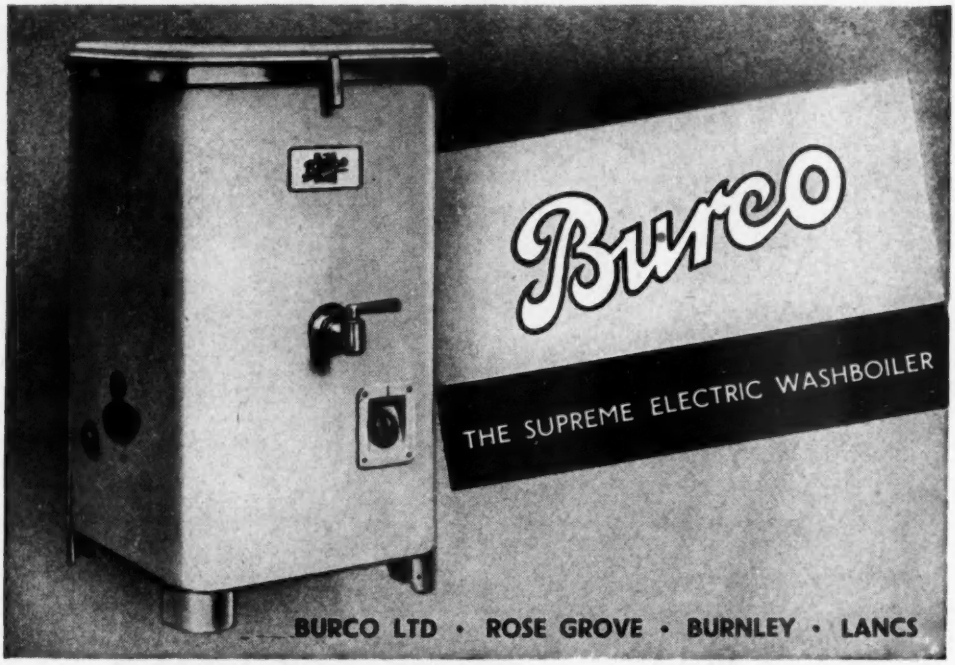

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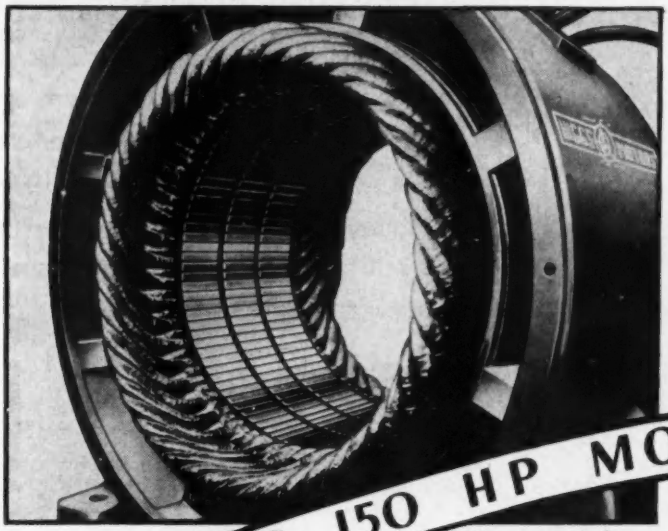

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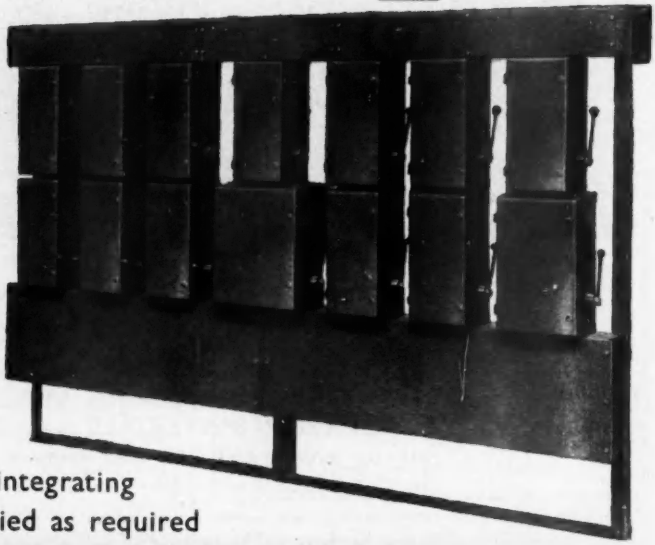

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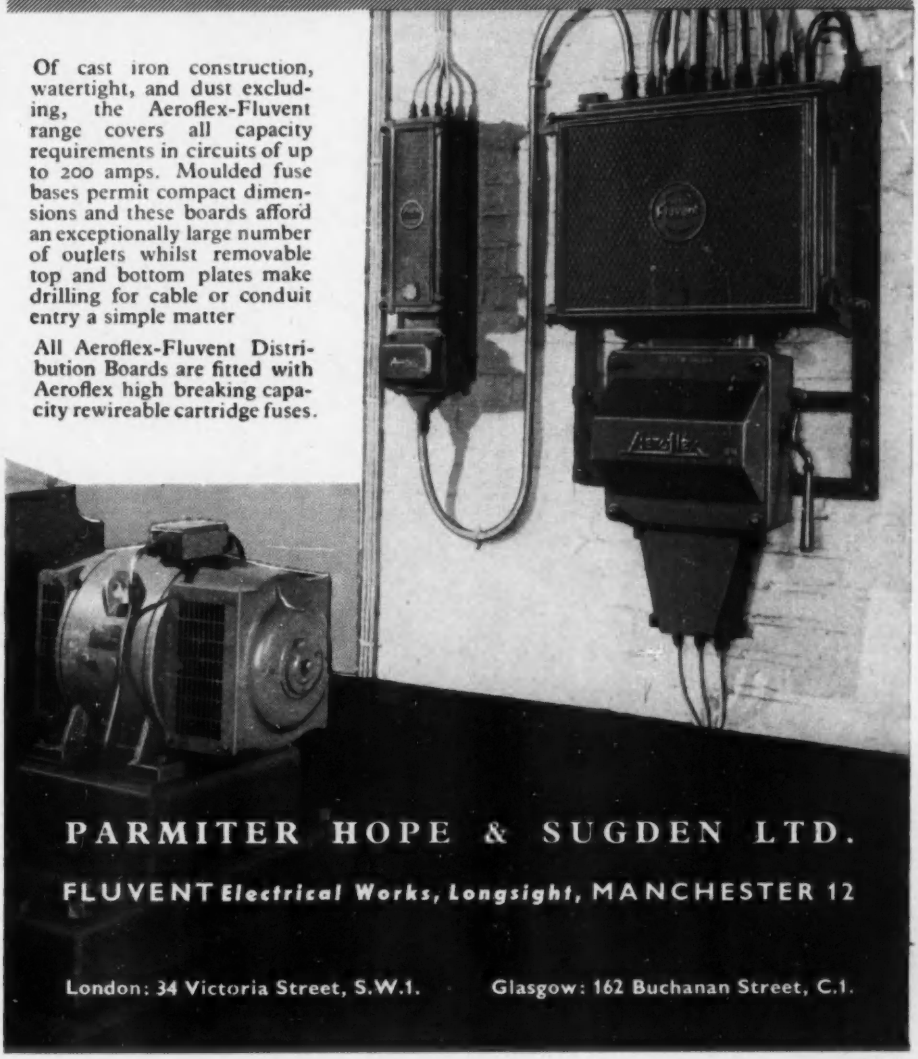

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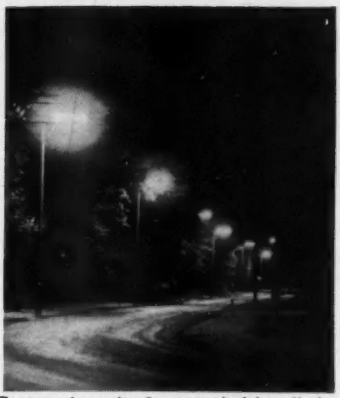

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